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ABSTRACT

This guide is intended for use in teaching a course in network applications for the automated environment. The modules cover disk operating system (DOS), NetWare, telecommunications, and printer applications. Both instructor and student materials have been included where appropriate. Also included is an outline of a workshop covering general networking concepts and specific NetWare features and procedures. The information included in the syllabus and instructor and student guides and materials included in this packet could also be used by current users of networks as an inservice activity to acquaint interested faculty with the pros and cons of networks or by colleges that are in the process of making decisions concerning possible networking of their microcomputer laboratories. (MN)

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ED299423

Curriculum Improvement Project

NETWORK APPLICATIONS FOR THE OFFICE ENVIRONMENT

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FOREWORD

Galveston College received a grant from the Coordinating Board of the Texas College and University System, Division of Community Colleges, to investigate the applications of network technology in an office occupations instructional laboratory. As a preliminary step, the College researched various networking tools and strategies. We decided upon Novell Netware v. 2.1 developed by Novell Incorporated of Provo, Utah. The software is running on a Novell 286A file server with an 80 Mb. fixed disk drive. Each workstation has a Standard MicroSystems ArcNet interface card and is connected to the file server through a distributed star typology. We currently have nine workstations and three printers in the network, with plans to add an additional 10-15 workstations over the next year. Our network system also includes a Mountain tape backup, a Hayes 1200 baud internal modem, and an uninterruptable power supply. We are currently running numerous application software packages through the network, including WordPerfect 4.2, Multimate Advantage, Multimate Advantage II, Wordstar 2000 Plus Release 2 and Release 3, DisplayWrite 4, and dBase III Plus, along with various tutorials. We have been very pleased with the reliability of the network and its relatively trouble-free operation.

The grant also enabled us to revise our curriculum based on our evaluation of the competencies our students were achieving compared to those needed by personnel working in the automated office. As a result of this "gap analysis," we developed a cluster of modules around network applications and a curriculum guide for a course in Corporate Electronic Publishing Systems. The modules in this packet, Network Applications for the Office Environment, include instructional materials for DOS applications, Netware Applications, Telecommunications Applications, and Printer Applications. Where appropriate, we have included both instructor and student materials. We have also included an outline of a workshop covering general networking concepts and specific NetWare features and procedures. The information could be used by current users of networks as an in-service activity to acquaint interested faculty in the pros and cons of networks. It could also be used by those colleges trying to make a decision concerning possible networking of their microcomputer laboratories.

My thanks go to those people who worked with me on this project--Dwight Courtney, Ed Crowley, Maria Eliaz, Jean Jahoor, and Julius Kimling of Galveston College and Beth Hill of McLennan Community College in Waco, Texas. I also wish to express my gratitude to the personnel in the Division of Community Colleges and Technical Institutes of the Coordinating Board for their assistance and guidance. Questions or comments about this project may be directed to me at (409) 763-6551.

Cheryl L. Willis, Ph.D.
Project Director

DOS APPLICATIONS

INSTRUCTOR MATERIALS

NETWORK APPLICATIONS FOR THE OFFICE ENVIRONMENT

INSTRUCTOR'S GUIDE

PC/DOS SYLLABUS

DESCRIPTION:

This module cluster will include PC/DOS concepts, PC/DOS fundamental commands and PC/DOS concepts, PC/DOS hard disk management commands.

PROCEDURE:

Each module refers to objectives that will be covered in that module. If you have previous experience with the information in that module, you may ask to test out of the module. If you score 90% or above on the test, proceed with the next module. If you score less than 90%, do all the learning activities assigned in the module and retest before proceeding with the next module in the cluster.

TEXTBOOK:

UNDERSTANDING AND USING MS-DOS/PC-DOS, by Cody T. Copeland and Jonathan Bacon; West Publishing Company, c1987.

Instructor's manual to accompany above text.

SUPPLIES AND MATERIALS:

PC/DOS, Version 3.1, four 5 1/4" disks with jackets

OBJECTIVES:

1. Describe the functions of microcomputer disk operating systems.
2. Identify external and internal DOS commands
3. Demonstrate an understanding of legal DOS filenames.
4. Demonstrate an understanding of selected fundamental DOS commands.
5. Demonstrate an understanding of selected hard disk management commands.

EVALUATION:

Tests or exercises are given for each module. The weight of the tests/exercises will be determined by the instructor using the modules.

PC/DOS
MODULE II TEST

1. What does the DOS format command do?

2. Write the command to format a non-system disk in drive a:.

3. What does the volume label do. Why would you use it?

4. Write the command to format a non-system disk in drive b: with a volume label.

5. What is the difference between a system disk and a non-system disk?

6. Write the command to format a system disk.

7. Which DOS command makes an exact copy of one disk onto another?

8. a. Which DOS command is used to compare two disks.

   b. This command is valid only after using which command?

PC/DOS
MODULE II TEST KEY

1. What does the DOS format command do?

   It prepares a disk to receive data, it creates a clean surface on the disk and removes all data, it checks the disk surface for damage and identifies bad sectors on the disk, and it divides the disk into tracks and sectors.

2. Write the command to format a non-system disk in drive a:.

   FORMAT A:

3. What does the volume label do. Why would you use it?

   The volume label gives the disk a name. You would use it to help keep your disks organized. For example, files pertaining to one subject would be kept on one disk labeled for that subject, another subject on another disk, etc.

4. Write the command to format a non-system disk in drive b: with a volume label.

   FORMAT B:/V

5. What is the difference between a system disk and a non-system disk?

   The system disk is self-booting and contains the file command.com.

6. Write the command to format a system disk in drive B:.

   FORMAT B:/S

7. Which DOS command makes an exact copy of one disk onto another?

   DISKCOPY

8. a. Which DOS command is used to compare two disks.

      DISKCOMP

   b. This command is valid only after using which command?

      DISKCOPY

PC/DOS
MODULE 3 TEST

1. Write the command that will clear your monitor.

2. Write the command that will list your filenames and extensions horizontally. Does this command also give you the size of the files?

3. Write the command that lists the filenames vertically one screen at a time.

4. Write the command that gives you this information for the disk in drive b: total disk space, bytes in hidden files, bytes in user files, bytes in total memory, and bytes free.

5. Write the commands you would use to create a file named schedule.txt and list your current class schedule in this file. Store the file on your disk in drive b:.

6. Write the command you would use to copy all the files on the disk in drive b: to the disk in drive a:.

7. Write the command you would use to copy all the files with the extension .wks to a disk in drive b:.

8. Write the command you would use to change the name of a file from TEST1.UN1 to TEST3.UN1.

9. The command copy fall2.lst fall3.lst will give the file named fall2.lst a new name. True or False

10. Suppose you have 9 files that are named assign1.txt, assign2.txt, assign3.txt, etc. up to assign9.txt that you want to copy from a disk in drive a: to a disk in drive b:. Write two wildcard commands that would result in copying these files only to a disk in drive b:.

11. Write the command to remove a file named practice.wks from the disk in drive b:.

12. Write the command to remove all the files with a .dbf extension from the disk in drive b:.

PC/DOS
MODULE 3 TEST KEY

1. Write the command that will clear your monitor.

   CLS

2. Write the command that will list your filenames and extensions horizontally. Does this ommand also give you the size of the files?

   DIR/W
   NO

3. Write the command that lists the filenames vertically one screen at a time.

   DIR/P

4. Write the command that gives you this information for the disk in drive b: total disk space, bytes in hidden files, bytes in user files, bytes in total memory, and bytes free.

   CHKDSK B:

5. Write the commands you would use to create a file named schedule.txt and list your current class schedule in this file. Store the file on your disk in drive b:.

   COPY CON B:SCHEDULE.TXT
   CLASS SCHEDULE LIST WILL VARY FOR EACH STUDENT
   ^Z OR F6

6. Write the command you would use to copy all the files on the disk in drive b: to the disk in drive a:.

   COPY B:*.* A:

7. Write the command you would use to copy all the files with the extension .wks to a disk in drive b:. (Assume you are at the A) and that you are copying from a disk in drive a:.)

   COPY *.WKS B:

8. Write the command you would use to change the name of a file from TEST1.UN1 to TEST3.UN1.

   REN TEST1.UN1 TEST3.UN1

9. The command copy fall2.lst fall3.lst will make an exact copy of fall2.lst, but will give the copy the name fall3.lst.

   False

10. Suppose you have 9 files that are named assign1.txt, assign2.txt, assign3.txt, etc. up to assign9.txt that you want to copy from a disk in drive a: to a disk in drive b:. Write two wildcard commands that would result in copying these files only to a disk in drive b:. Assume you are at the A>.

    copy assign*.* b: or copy assign*.txt b:
    copy assign?.txt b:

11. Write the command to remove a file named practice.wks from the disk in drive b:.

    del b:practice.wks or erase b: practice.wks

12. Write the command to remove all the files with a .dbf extension from the disk in drive b:.

    del b:*.dbf or erase b:*.dbf

PC/DOS
MODULE 4 TEST

1. Why do you divide a disk into subdirectories?

2. Write the command to go to a subdirectory with this path: WP\SMITH.

3. Write the commands to:
create a subdirectory named WP off of the root directory

create three subdirectories under WP with these names: Smith, Jones, and Hill

create a subdirectory named SC off of the root directory

create two subdirectories under SC with these names: Mitchell, Lansing

create a subdirectory named ACCOUNTS off of the root directory

create four subdirectories under ACCOUNTS with these names: Janek, Williams, Sleeper, and Levi

4. Write the command to go to the subdirectory Hill.

5. Write the command to copy a file named class2.lst from a disk in drive a: to the subdirectory Williams. (Assume that you are at the A> and that you have the disk created in question # 3 in drive b: when the command is issued.)

6. Write the commands you would use to remove the directory named Mitchell. Assume that the directory has files stored in it.

7. Which command would allow you to view the directories on a disk?

8. What is the name used to designate the first directory on a disk?

PC/DOS
MODULE 4 TEST KEY

1. Why do you divide a disk into subdirectories?

   to organize your files logically so that you can find different type of files easily

2. Write the command to go to a subdirectory with this path: WP\SMITH.

   CD \WP\SMITH OR CHDIR \WP\SMITH

3. Write the commands to :
   create a subdirectory named WP off of the root directory

   MD \WP OR OR MKDIR \WP

   create three subdirectories under WP with these names: Smith, Jones, and Hill

   MD \WP\SMITH OR MKDIR \WP\SMITH
   MD \WP\JONES OR MKDIR \WP\JONES
   MD \WP\HILL OR MKDIR \WP\HILL

   create a subdirectory named SC off of the root directory

   MD \SC OR MKDIR \SC

   create two subdirectories under SC with these names: Mitchell, Lansing

   MD \SC\MITCHELL OR MKDIR \SC\MITCHELL
   MD \SC\LANSING OR MKDIR \SC\LANSING

   create a subdirectory named ACCOUNTS off of the root directory

   MD \ACCOUNTS OR MKDIR \ACCOUNTS

   create four subdirectories under ACCOUNTS with these names: Janek, Williams, Sleeper, and Levi

   MD \ACCOUNTS\JANEK OR MKDIR \ACCOUNTS\JANEK
   MD \ACCOUNTS\WILLIAMS OR MKDIR \ACCOUNTS\WILLIAMS
   MD \ACCOUNTS\SLEEPER OR MKDIR \ACCOUNTS\SLEEPER
   MD \ACCOUNTS\LEVI OR MKDIR \ACCOUNTS\LEVI

4. Write the command to go to the subdirectory Hill.
   Assume you are in the root directory.

   CD \WP\HILL OR CHDIR \WP\HILL

5. Write the command to copy a file named class2.lst from a disk in drive a: to the subdirectory Williams. (Assume that you are at the A> and that you have the disk created in question # 3 in drive b: when the command is issued.)

   COPY CLASS2.LST B:\ACCOUNTS\WILLIAMS

6. Write the commands you would use to remove the directory named Mitchell. Assume that the directory has files stored in it.

   CD \SC\MITCHELL OR CHDIR \SC\MITCHELL

   DEL *.*

   CD \ OR CHDIR \ OR CD \SC OR CHDIR \SC

   RD \SC\MITCHELL

7. Which command would allow you to view the directories on a disk?

   TREE

8. What is the name used to designate the first directory on a disk?

   ROOT

STUDENT MATERIALS

NETWORK APPLICATIONS FOR THE OFFICE ENVIRONMENT

STUDENT'S GUIDE

PC/DOS SYLLABUS

DESCRIPTION:

This module cluster will include PC/DOS concepts, PC/DOS fundamental commands and PC/DOS hard disk management commands.

PROCEDURE:

Each module refers to objectives that will be covered in that module. If you have previous experience with the information in that module, you may ask to test out of the module. If you score 90% or above on the test, proceed with the next module. If you score less than 90%, do all the learning activities assigned in the module and retest before proceeding with the next module in the cluster.

TEXTBOOK:

UNDERSTANDING AND USING MS-DOS/PC-DOS, by Cody T. Copeland and Jonathan Bacon; West Publishing Company, c1987.

SUPPLIES AND MATERIALS:

PC/DOS, Version 3.1, four 5 1/4" disks with jackets

OBJECTIVES:

1. Describe the functions of microcomputer disk operating systems.
2. Identify external and internal DOS commands.
3. Demonstrate an understanding of legal DOS filenames.
4. Demonstrate an understanding of selected fundamental DOS commands.
5. Demonstrate an understanding of selected hard disk management commands.

PC/DOS
MODULE I -- INTRODUCTION TO OPERATING SYSTEMS

NOTE: THE TEXTBOOK INCLUDES AN ASSIGNMENTS SECTION. DO ONLY THE ASSIGNMENTS LISTED IN THIS MODULE. DISREGARD ASSIGNMENTS LISTED IN THE TEXT UNLESS THIS MODULE INSTRUCTS YOU TO COMPLETE THEM.

OBJECTIVES:

Read the objectives for this module on page 3 of UNDERSTANDING AND USING MS-DOS/PC-DOS.

LEARNING ACTIVITIES:

1. Read pages 4-22 of the textbook.

2. Complete questions 1, 2, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 17, and 18 on page 23 of the textbook in written form and turn in to your instructor for grading.

EVALUATION:

The review questions will serve as the evaluation of this module.

PC/DOS
MODULE II--DISK PREPARATION COMMANDS

NOTE: THE TEXTBOOK INCLUDES AN ASSIGNMENTS SECTION. DO ONLY THE ASSIGNMENTS LISTED IN THIS MODULE. DISREGARD ASSIGNMENTS LISTED IN THE TEXT UNLESS THIS MODULE INSTRUCTS YOU TO COMPLETE THEM.

OBJECTIVES:

1. Explain the use of the format command.
2. Format a non-system disk.
3. Format a non-system disk with a volume label.
4. Format a system disk.
5. Create a duplicate disk.
6. Compare a newly created disk with the original.

LEARNING ACTIVITIES:

1. Complete GUIDED ACTIVITY: LOADING DOS 3.10 on pages 28-29 of the text.
2. Read the FORMAT COMMAND on pages 29 & 30 of the text.
3. Complete GUIDED ACTIVITY: FORMAT A NON-SYSTEM DISKETTE on pages 30 & 31 of the text.
4. Complete GUIDED ACTIVITY: FORMAT NON-SYSTEM DISKETTE WITH VOLUME LABEL on pages 31 & 32.
5. Complete GUIDED ACTIVITY: FORMATTING A SYSTEM DISKETTE on pages 32 & 33.
6. Complete GUIDED ACTIVITY: FORMAT SYSTEM DISKETTE WITH VOLUME LABEL on pages 33 & 34.
7. Read the DISKCOPY COMMAND section on page 40.
8. Complete GUIDED ACTIVITY: MAKING A DUPLICATE DISK USING DISKCOPY COMMAND on page 40.
9. Read the DISKCOMP COMMAND section at the bottom of page 41.

10. Complete GUIDED ACTIVITY: COMPARING TWO DISKETTES WITH DISKCOMP on page 42.

EVALUATION

Take PC/DOS--Module 2 Test.

PC/DOS
MODULE 3--HOUSEKEEPING COMMANDS AND FILE MANAGEMENT COMMANDS

NOTE: THE TEXTBOOK INCLUDES AN ASSIGNMENTS SECTION. DO ONLY THE ASSIGNMENTS LISTED IN THIS MODULE. DISREGARD ASSIGNMENTS LISTED IN THE TEXT UNLESS THIS MODULE INSTRUCTS YOU TO COMPLETE THEM.

OBJECTIVES:

1. Explain what the chkdsk command does.
2. Use the Chkdsk command to determine total amount of disk space in bytes.
3. Use the Chkdsk command to determine bytes available on a disk.
4. Use the Chkdsk command to determine the amount of memory available in the computer.
5. Use the Chkdsk command to determine the amount of memory used by the computer.
6. Use the Dir command to determine the date, time, and bytes used by a file.
7. Use the Cls command to clear the monitor screen.
8. Use the Copy command to copy files to your screen.
9. Use the Copy command to copy files to your printer.
10. Use the copy command to copy files to other disk drives.
11. Create a file using the Copy command.
12. Copy files using wildcard characters.
13. Combine files to form one file.
14. Use the Comp command to compare files.
15. Use the Rename command to change the name of a file.
16. Use the Delete command to delete files.

LEARNING ACTIVITIES:

1. Read the HOUSEKEEPING COMMANDS section and the CHKDSK COMMAND section on page 46 of the text.
2. Complete GUIDED ACTIVITY: USING THE CHKDSK COMMAND on pages 46 & 47.
3. Read about the directory command on page 49.

4. Complete GUIDED ACTIVITY: SCANNING A FILE on page 49.
5. Complete GUIDED ACTIVITY: STOPPING THE SCREEN FROM SCROLLING on page 50.
6. Complete GUIDED ACTIVITY: HORIZONTAL FILENAMES on page 50.
7. Complete GUIDED ACTIVITY: DIR COMMAND WITH PAUSE on page 51.
8. Complete GUIDED ACTIVITY: CLS COMMAND on page 51.
9. Read FILE MANAGEMENT COMMANDS section on page 58.
10. Complete GUIDED ACTIVITY: STARTING THE COMPUTER on page 58.
11. Read the COPY COMMAND section on page 59.
12. Complete GUIDED ACTIVITY: CREATING A FILE USING THE COPY COMMAND on page 59.
13. Complete GUIDED ACTIVITY: COPYING A FILE TO THE SCREEN on page 60.
14. Complete GUIDED ACTIVITY: COPY A FILE TO ANOTHER DRIVE on page 60.
15. Complete GUIDED ACTIVITY: CREATE ANOTHER FILE on pages 60 & 61.
16. Complete GUIDED ACTIVITY: COPYING FILES WITH WILDCARD CHARACTERS on page 62.
17. Complete GUIDED ACTIVITY: COPY A FILE TO THE SAME DRIVE AND DIRECTORY on pages 62 & 63.
18. Complete GUIDED ACTIVITY: COPYING MORE FILES WITH WILDCARDS on page 63.
19. Complete GUIDED ACTIVITY: COPYING WITH *.* on page 64.
20. Complete GUIDED ACTIVITY: COMBINING FILES on page 64.
21. Complete GUIDED ACTIVITY: COPYING A FILE TO PRINTER on page 64.
22. Read the COMP COMMAND section on page 65.
23. Complete GUIDED ACTIVITY: COMPARING FILES WITH COMP COMMAND on page 65.
24. Read the RENAME COMMAND section on page 66.
25. Complete GUIDED ACTIVITY: CHANGING A FILE NAME on page 66.
26. Read the DELETE/ERASE COMMAND section on page 67.
27. Complete GUIDED ACTIVITY: DELETING A SINGLE FILE FROM THE CURRENT DRIVE on page 68.

28. Complete GUIDED ACTIVITY: USING WILDCARD CHARACTERS WITH THE DEL COMMAND on page 68.

EVALUATION:

Take PC/DOS--Module 3 Test.

PC/DOS
MODULE 4 -- HARD DISK MANAGEMENT COMMANDS

OBJECTIVES:

1. Explain why you divide a hard disk into subdirectories.
2. Use the Mkdir (MD) command to make a subdirectory on a disk.
3. Use the Chdir (CD) command to change to subdirectory on a disk.
4. Use the Rmdir (RD) command to remove a subdirectory from a disk.
5. Use the Tree command to view the directories and files on a disk.
6. Use the Path command to direct information to and from directories.

LEARNING ACTIVITIES:

1. Read the HARD DISK MANAGEMENT COMMANDS section on page 114.
2. Complete GUIDED ACTIVITY: STARTING THE COMPUTER on pages 114 & 115.
3. Read the MKDIR COMMAND section on page 115.
4. Complete GUIDED ACTIVITY: MAKING SUBDIRECTORIES on pages 115 & 116.
5. Read the CHDIR COMMAND section and complete the steps outlined on pages 116 & 117.
6. Complete GUIDED ACTIVITY: MAKING ANOTHER SUBDIRECTORY on pages 117 & 118.
7. Complete GUIDED ACTIVITY: COPYING A FILE TO A SUBDIRECTORY on pages 118 & 119.
8. Read the PATH COMMAND section on pages 119 & 120.
9. Complete GUIDED ACTIVITY: NAMING THE PATH on page 120.
10. Complete GUIDED ACTIVITY: RESETTING THE PATH COMMAND TO DEFAULT on page 121.
11. Complete GUIDED ACTIVITY: SETTING A NEW PATH COMMAND on pages 121 & 122.
12. Complete GUIDED ACTIVITY: SETTING A PATH TO A DIFFERENT DRIVE on pages 122 & 123.
13. Read the TREE COMMAND AND RMDIR COMMAND sections on pages 123 through 126 and complete the steps outlined in each.

14. Using the commands you have learned in this unit, set up your disk with a subdirectory for each class in which you are currently enrolled. Use the CD command to move to the different subdirectories once they are set up and to store documents for different classes in the different subdirectories.

EVALUATION:

Take PC/DOS--Module 4 Test.

NETWARE APPLICATIONS

INSTRUCTOR MATERIALS

NETWORK APPLICATIONS FOR THE OFFICE ENVIRONMENT

INSTRUCTOR'S GUIDE

NETWARE SYLLABUS

DESCRIPTION:

This module cluster includes Novell NetWare concepts and terminology, selected NetWare command line utilities, and an introduction to the NetWare electronic mail system. Includes hands-on exercises for command line utilities and the electronic mail system.

PREREQUISITES:

The student should be competent in use of these DOS commands: format, chkdsk, dir, cls, copy, rename, delete, erase, make directory, change directory, remove directory, path. Also should be competent in use of DOS wildcard characters.

PROCEDURE:

Obtain a login name and password from the network manager or instructor. Read the objectives of each module. Then complete the Learning Activities in the order given. When working a lab exercise, do the steps in order. Ask instructor for a test on one module before proceding to the next one.

TEXTBOOK:

No textbook is required. The modules contain handouts and exercises. Two manuals that are a part of NetWare documentation are recommended for reference as needed:
NETWARE USER REFERENCE, PART III: COMMAND LINE UTILITIES AND NETWARE USER REFERENCE, PART V: ELECTRONIC MAIL.

SUPPLIES AND MATERIALS:

The Novell NetWare should be set up for student use in these modules as specified in INSTRUCTIONS TO NETWORK MANAGER/INSTRUCTOR.

NETWARE MODULES

WORK STATION BOOT DISK

DATA DISK FOR STUDENT HOME DRIVE

OBJECTIVES:

1. Describe the NetWare security structure, mapping, and search paths.
2. Define selected NetWare terms and commands.
3. Demonstruate an understanding of selected NetWare commands.
4. Demonstrate an understanding of NetWare electronic mail commands.

EVALUATION:

Tests and exercises accompany each module. The weight of the tests/exercises will be determined by the instructor using the modules.

NETWARE

INSTRUCTIONS TO NETWORK MANAGER/INSTRUCTORS

PRINTERS

The lab exercises in the NetWare Modules assume that you have three printers connected to FS1 on your network-- printer 0, printer 1, and printer 2. If your network is configured differently, change the nprint and spool exercises to match your printer configuration.

DIRECTORY STRUCTURE

The exercises require students to map to and use different directories on the network. Please set up the following directory structure for student use in the NetWare Module exercises.

1. Create these directories on FS1: SYS:WP, SYS:SPR, AND SYS:DB.

2. Set the maximum rights mask in these directories to Read, Open and Search rights.

3. The exercises also refer to the four standard directories used with NetWare: SYS:SYSTEM, SYS:LOGIN, SYS:MAIL, AND SYS:PUBLIC.

4. Copy files from the Netclass disk provided as follows:
   Copy files with the extension .txt to the SYS:WP directory.

   Copy files with the extension .wks to the SYS:SPR directory.

   Copy files with the extension .dbf to the SYS:DB directory.

ADD USERS TO THE NETWORK (Use SYSCON for these steps.)

1. Create a group called NETCLASS.

2. Give the group NETCLASS the following trustee assignments:

   SYS:WP Read, Open, Search
   SYS:SPR Read, Open, Search
   SYS:DB Read, Open, Search
   SYS:PUBLIC Read, Open, Search

READ STEPS 3-6 BEFORE YOU START ADDING USERS TO THE NETWORK.

3. Add the following users to the network: Guest1 through Guest20. A suggested format for the Full Name is Network Guest 1, etc. A suggested Password routine is PW1, PW2, etc.

4. Create this login script listed on the next page for user Guest1 and copy it to Guest2-20 as you add them to the net.

5. Add each user to the group NETCLASS. Delete each user from the default group EVERYONE.

6. Trustee Assignments include the student's home directory as follows: SYS:STU/GUEST1, SYS:STU/GUEST2, etc. You can create these home directories as each user is added to the network. Give these users all rights except parental in their home directories. Be sure that the home directory name and the login name match.

The default assignment to SYS:MAIL which is automatically set up by the system when you create a user will be used. It does not need to be changed.

If your current system is set up to automatically login users via an autoexec.bat file or otherwise, you will need to prepare a workstation boot disk which sets up the workstation for network use but does not login users automatically. Instead, users will use the LOGIN command line utility. See NetWare reference manuals for more information on preparing the workstation boot disk.

Assign each student a username Guest1 through Guest20 for use throughout the NetWare Modules.

NETWARE
MODULE 1 TEST

1. The command ____ replaces the DOS chkdsk command.

2. The DOS command ___ should never be used on the network because it attempts to delete all files in the root directory of the related NetWare volume.

3. Map replaces the DOS command ___.

4. What is the difference between the volinfo command and the chkvol command?

5. To display a list of file servers on this network, use the ___ command.

6. a. To find out which users are currently logged into the net, execute the ___ command.

   b. List the other information this command gives you.

7. If you are working on FS1 and want to also have access to FS2, type ___.

8. a. What is the command to recover files that have been deleted using the DOS delete or erase command.? _____

   b. List the three commands you cannot execute before executing the above command.

9. a. What does the delete or erase command actually do with a file?

   b. What command permanently removes a file from a network drive?

10. To find out your login name, connection number, file server you are attached to, type ___.

NETWARE
MODULE 2 TEST

PART I

1. The four levels of NetWare security are listed below. Define each level and describe how each works.

   a. Login/Password--

   b. Trustee--

   c. Directory--

   d. File Attributes--

2. What are effective rights? Give an example.

3. Define shareable read only.

4. What is the default or normal file attribute of files stored on the network?

5. a. What are drive mappings?

   b. How many drive mappings are available with NetWare?

c. Which letters are assigned to network drives?

PART II

Define the following network commands:

6. Map--

7. Rights--

8. Udir--

9. Listdir or Showdir--

10. Spool--

11. Endspool--

12. If you type flag and press enter what will be displayed?

13. a. If you want to set file attributes in your home directory so that your files cannot be changed, what command would you type? Assume you are at the H>.

b. To set them back to normal, you would type:

14. Write the command to send the file micros.txt to printer 1 on the network.

NETWARE
MODULE 2 TEST KEY

PART I

1. The four levels of NetWare security are listed below. Define each level and describe how each works.

   a. Login/Password--
   governs access to the file server; if either the login name or the password is typed incorrectly, the system will not log you in.

   b. Trustee--
   determines what you can do in a certain directory by assigning you trustee rights; rights include read,, write, create, delete, parental, search, and modify. A user can have all of these, a few of them, or none of them in a certain directory.

   c. Directory--
   same as above, except at the directory level instead of the user level. A directory has the same list of rights; these are set in the maximum rights mask of the directory.

   d. File Attributes--
   security level which determines what you can do with files in a directory; include read/write or read only and shareable or non-shareable

2. What are effective rights? Give an example.

   the rights a user has in a certain directory that are the same as those in that directory's maximum rights mask. For example, if a user has read, write, create, modify, search, parental, open and delete in the directory sys:db, but the directory's maximum rights mask is set to read, search, and open, the user's effective rights in that directory are read, search, and open.

3. Define shareable read only.

   Shareable means that this is a file that can be used by more than one user at a time on the network.

   Read only means that the original file cannot be changed; it can only be read.

4. What is the default or normal file attribute of files stored on the network?

   non-shareable read/write

5. a. What are drive mappings?
   allow network users to organize and easily access the directories on the file server's hard disk by enabling the user to map a drive letter to a directory.

b. How many drive mappings are available with NetWare?

21

c. Which letters are assigned to network drives?

F through Z

PART II

Define the following network commands:

6. Map--assigns network drives to directories and displays such assignemnts.

7. Rights--displays your effective rights in the directory specified

8. Udir--globally searches through a directory or directories for a specified file or files

9. Listdir or Showdir--displays the directory structure of a specified volume, drive, or directory; also displays the maximum rights mask and the time, and date of creation for each directory below the one specified

10. Spool--saves files so that they can be printed on network printers

11. Endspool--closes the spool files saved by the print command

12. If you type flag and press enter what will be displayed?
a list of files in the current directory followed by their current file attributes

13. a. If you want to set file attributes in your home directory so that your files cannot be changed, what command would you type? Assume you are at the H>.

flag *.* sro

b. To set them back to normal, you would type:

flag *.* n

14. Write the command to send the file micros.txt to printer 1 on the network.

nprint micros.txt s=fs1 p=1

NETWARE
MODULE 4 TEST

1. How does a user get a "mailbox" on the network?

2. Which rights do you have in your mailbox?

3. Other users can place mail in your mailbox, can view it and alter it.

   True or False

4. It is possible to mail large files, but it is recommended to send a memo to a user to tell him where to look for a file on the network. True or False
   Why?

5. Define the four types of network mail.

   a. file--

   b. document--

   c. letter--

   d. memo--

6. List three ways to select mail.

7. List the exact commands you would use to send a memo named lunch saying "Let's go to lunch tomorrow." to user Guest17. Assume you are logged in to your home drive.

8. List the exact commands Guest17 would execute to read the mail sent in question 7.

9. List the commands to delete all your mail from your box and exit the EMS system.

NETWARE
MODULE 4 TEST KEY

1. How does a user get a "mailbox" on the network?

   The system automatically creates a mailbox for each user on the network.

2. Which rights do you have in your mailbox?

   All rights except parental.

3. Other users can place mail in your mailbox, can view it and alter it.

   True or False

4. It is possible to mail large files, but it is recommended to send a memo to a user to tell him where to look for a file on the network. True or False
   Why?

   Mailing large files on the network actually creates a copy of the files and therefore takes up too much space.

5. Define the four types of network mail.

   a. file--non message oriented files, such as raw data files, program source files, and binary image files

   b. document--word-processed documents or text files

   c. letter--message oriented text files (usually lengthy or general purpose in nature)

   d. memo--relatively short messages addressing specific subjects

6. List three ways to select mail.

   by source
   by time/date
   by type

7. List the exact commands you would use to send a memo named lunch saying "Let's go to lunch tomorrow." to user Guest17. Assume you are logged in to your home drive.

Type:
MAIL
EDIT LUNCH
"Let's go to lunch tomorrow."
F2 (key)
SEND MEMO LUNCH TO GUEST17

8. List the exact commands Guest17 would execute to read the mail sent in question 7.

Type:
MAIL
OPEN ALL MAIL OR may specify name, no. etc.
LIST
READ OR may specify name, no. etc.

9. List the commands to delete all your mail from your box and exit the EMS system.

REMOVE ALL MAIL
QUIT

STUDENT MATERIALS

NETWORK APPLICATIONS FOR THE OFFICE ENVIRONMENT

STUDENT'S GUIDE

NETWARE SYLLABUS

DESCRIPTION:

This module cluster includes Novell NetWare concepts and terminology, selected NetWare command line utilities, and an introduction to the NetWare electronic mail system. Includes hands-on exercises for command line utilities and the electronic mail system.

PREREQUISITES:

The student should be competent in use of these DOS commands: format, chkdsk, dir, cls, copy, rename, delete, erase, make directory, change directory, remove directory, path. Also should be competent in use of DOS wildcard characters.

PROCEDURE:

Obtain a login name and password from the network manager or instructor. Read the objectives of each module. Then complete the Learning Activities in the order given. When working a lab exercise, do the steps in order. Ask instructor for a test on one module before proceeding to the next one.

TEXTBOOK:

No textbook is required. The modules contain handouts and exercises. Two manuals that are a part of NetWare documentation are recommended for reference as needed: NETWARE USER REFERENCE, PART III: COMMAND LINE UTILITIES AND NETWARE USER REFERENCE, PART V: ELECTRONIC MAIL.

SUPPLIES AND MATERIALS:

The Novell NetWare should be set up for student use in these modules as specified in INSTRUCTIONS TO NETWORK MANAGER/INSTRUCTOR.

NETWARE MODULES

WORK STATION BOOT DISK

DATA DISK FOR STUDENT HOME DRIVE

OBJECTIVES:

1. Describe the NetWare security structure, mapping, and search paths.
2. Define selected NetWare terms and commands.
3. Demonstrate an understanding of selected NetWare commands.
4. Demonstrate an understanding of NetWare electronic mail commands.

NETWARE
MODULE 1

OBJECTIVES:

1. Define access, banner, command, command format, home directory, parameter, prompt, station number, login script, local drive, and network drive.

2. List DOS commands which may not function properly on the network.

3. Describe and demonstrate understanding of the following NetWare commands:

   Login
   Chkvol
   Volinfo
   Whoami
   Slist
   Systime
   Userlist
   Attach
   Send
   Salvage
   Purge

LEARNING ACTIVITIES:

1. Read and study the handout NETWARE TERMS, MODULE 1.

2. Read and study the handout DOS COMMANDS NOT COMPATIBLE WITH NETWARE.

3. Complete NETWARE MODULE 1, EXERCISE 1. Ask your instructor if you should print screens while doing this exercise. The exercise instructions include several print screens, but you may omit these if your instructor advises you not to use the print screen key. If you use the print screen key, you will need to have a local printer attached to your workstation.

EVALUATION:

Take NetWare Module 1 Test.

MODULE 1
NETWARE TERMS

Access--The ability to work with files. With NetWare, usually used in connection with files stored on network disks. Various access rights may be assigned to users.

Banner--A one-page information sheet, printed as the first page of a printout. A banner identifies the printout's creator, and includes the filename, the station number, and the print date.

Command--A user-entered instruction which specifies a computer operation to be performed.

Command Format--The proper way to type a command entry, including any key words, spacing, parameters, delimiters, or other special requirements.

Communication--Sending data from one station and receiving the data at another station.

Home Directory--The directory to which a user's first network drive is mapped when the user logs in to a file server. The network drive is mapped by the user's existing login script. The network drive and the login script are usually set up by the network manager.

Local Drive--When using DOS 3.0 or higher on the network, drives A, B, C, D, and E are local drives. They may be disk drives, tape drives, etc.

Login Script--A file which executes when a user logs in to the file server; may contain a greeting, instructions displayed on the screen and drive mappings for that user.

Network Drive--When using DOS 3.0 or higher on the network, drives F-Z may be specified as network drives. These point to a chosen directory on a particular volume of a particular file server.

Parameter--An item which may be specified by a user as part of a command format. Examples of a parameter are a drive letter, a directory, and filename.

Prompt--A character or message (from the software) which appears on the display screen and requires a user response.

Station Number--A number assigned to any workstation which logs into a file server; it may be a different number each time a station logs in.

DOS COMMANDS NOT COMPATIBLE WITH NETWARE

Because NetWare is an extension of DOS, most DOS commands work normally on network drives. However there are a few DOS commands that may not work normally on a network drive.
These commands follow:

ASSIGN--The DOS ASSIGN command may work improperly when you are assigning drive equivalences, for example, b:=c:. Use the NetWare Map utility instead.

CHKDSK--Works only on local drives. For network drives, use CHKVOL.

COPY--May work improperly if a server or volume name is specified as part of the command format. To copy files between servers or volumes, use NCOPY instead.

DIR--Will not work properly if a server name or a volume name other than the default volume is specified; use UDIR instead.

LABEL--DO NOT use the DOS LABEL command on the network. LABEL attempts to delete all files in the root directory of the related NetWare volume.

PATH--Although NetWare supports the DOS PATH command, you should use the NetWare MAP command for mappir all drives. MAP does all things PATH can do, but it does additional things as well.

PRINT--To print any file on a shared network prnter, you must use the NetWare NPRINT OR SPOOL utilities. You may use the DOS PRINT command to send local or network files from your workstation to a local printer.

NETWARE
MODULE 1--EXERCISE 1

Introduction:

In this exercise, commands are defined and then the proper command format is given for you to execute the command. If you type the command and receive an error message, check to see that you used the correct command format and retype the command. If you are still not receiving the expected results, ask an instructor for assistance. Commands may be typed in uppercase or lowercase.

Get your username from your network manager or instructor. You will use the name given throughout the NetWare Modules.
Any commands you enter are preceded with the word Type:. If a command is not preceded with the word "Type:", just read the information given.

STEP #> indicates something you should do such as type a command, clear the screen, or do a print screen using the Prt Sc key.

Commands:

LOGIN--identifies you as an active user on a file server and gives you access to that file server.

STEP

1> Type: Login FS1/username (Your username should be GUEST#, with # being equal to 1 through 20.)

For example , if your username is Guest3,
Type: Login FS1/Guest3 Press enter.

You will be prompted by the system for a password.

2> Type: your password Press enter.

You will see a greeting and the H> (h prompt) on the screen. The network is set up so that all users, Guest1 through Guest20, login to the H> which is your home drive for these exercises.

3> PrtSc

4> CLS

CHKVOL--shows you how much space has been allocated to a given volume on a network disk and how much of that space has been used. This command replaces the chkdsk command in DOS.

5> Type: Chkvol Press enter.

The information displayed is for the volume you are logged into (SYS:)

6> PrtSc
7> CLS

VOLINFO--gives information similar to the Chkvol command; in addition to showing how much space is allocated to a volume and how much space is left, the VOLINFO command shows how many directory entries have been allocated and how many are available for use.

8> Type: Volinfo Press enter.

The statistics for the volume you are logged into will be displayed.

9> PrtSc

WHOAMI--displays your username, the file servers you are attached to, your connection number and the date and time of your last login.

10> Type: Whoami Press enter.

SLIST--displays a list of file servers attached to this network.

11> Type: Slist Press enter.

SYSTIME--displays a file server's current time and date.

12> Type: Systime Press enter.

13> PrtSc
14> Cls

USERLIST--displays a list of users who are currently logged into the network; includes a list showing each user's connection number and login time.

15> Type: Userlist Press enter.

16> PrtSc
17> Cls

ATTACH--may be executed only after logging into the network; if the network has more than one file server, ATTACH is used to log you into another file server.

Do this only if your network has more than one file server.
Ask your instructor before doing this command.

Type: Attach file server/username

For example, if your second file server is named fs2, and you are user Guest15, type:
Attach fs2/Guest15 Press enter.

You will be asked for your login name and password for fs2; you must be identified as a user on fs2 to do this command.

SEND--allows you to send a message up to 40 characters long to other workstations. To use this command, the user to whom you are sending the message must be logged in. Find out which users are logged in so that you can practice this fun command. For example, if user Guest15 is logged in you could proceed as follows:

18> Type: Send "Practicing NetWare commands is fun!" to FS1/Guest15 Press enter.

19> Type: Send "Lunchtime!" to FS1/Guest15

The following exercise will tell you to delete certain files from your home drive. Before continuing be sure that you are at the H>.

20> Type: Dir Press enter.

These files should display: pracdel.txt, pracsal.txt, and pracpur.txt.

21> Type: Erase pracdel.txt Press enter.

22> Type: dir Press enter.

You see that pracdel.txt has been deleted from the directory.

The DOS ERASE command does not delete a file permanently--it just marks it for deletion.

SALVAGE--recovers the file or files erased with the last Erase command you issued from your workstation. Salvage works only on network drives; it cannot be used on local drives.

23> Type: Salvage FS1/sys:stu/login name Press enter.

You should receive a message that pracdel.txt is recovered.

24> PrtSc

Salvage will not work if you execute a copy, purge, or erase command after executing the erase command.

25> Type: dir

26> PrtSc

27> cls

PURGE--permanently deletes files yu have previously marked for deletion with the DOS delete or erase command. It only purges files marked for deletion at your workstation.

28> Type: Erase *.txt Press enter.

29> Type: Purge Press enter.

30> Type: Salvage Fs1/sys:stu/guest# Press enter

You should receive a message "No files recovered." because the purge command has permanently removed these files from your home drive. Salvage will not work after a purge command is issued.

If you want to practice this exercise again, ask your instructor to copy the files back into your home drive.

NETWARE
MODULE 2

OBJECTIVES:

1. List and discuss the four levels of NetWare security.
2. List and define the eight rights that can be assigned at either the trustee or the directory level.
3. Define effective rights.
4. Define file attributes and list file attributes available with NetWare.
5. Define drive mappings and search drives, and know how many drive mappings and how many search drives are available on NetWare.
6. Describe and demonstrate use of the following NetWare commands:

   MAP
   RIGHTS
   UDIR
   LISTDIR OR SHOWDIR
   FLAG
   NCOPY
   NPRINT
   SPOOL
   ENDSPOOL
   QUEUE

LEARNING ACTIVITIES:

1. Read and study the handout NETWARE SECURITY AND DIRECTORY STRUCTURE.
2. Complete NETWARE MODULE 2, EXERCISE 1.

EVALUATION:

Take NETWARE MODULE 2 TEST.

NETWARE SECURITY AND DIRECTORY STRUCTURE

The four levels of NetWare Security are:

1. Login/Password
2. Trustee
3. Directory
4. File Attributes

LOGIN/PASSWORD security governs access to the file server. If either the login name or the password is typed incorrectly, the system will not log you in.

TRUSTEE and DIRECTORY security levels determine what you can do in a certain directory. For example, can you create files or only read existing files in a certain directory? The trustee rights and directory rights are set up separately. The eight rights that can be granted at these levels follow.

If you have...	You can...
Read Rights	Read files in that directory
Write Rights	Write to or change files
Open Rights	Open files
Create Rights	Create files
Delete Rights	Delete files
Parental Rights	Create subdirectories
Search Rights	Search the directory for files
Modify Rights	Change the file attributes

EFFECTIVE RIGHTS are those that you have at both the trustee level and the directory level. For example, if your trustee rights are read, write, open, create, delete, search and modify, but the directory rights are read, open and search, your effective rights would be read, open and search.

The directory rights, called the maximum rights mask, are set up by the network manager as are trustee rights.

FILE ATTRIBUTES determine what a user can do with a file. They include:

Read/Write	Shareable
Read Only	Nonshareable

If a file is read/write, you can read the file and write to it (change it).

If a file is read only, you can read it, but not write to it.

Shareable means that the file may be used by more than one user on the net at one time.

Non-shareable means that the file is not shared by other users on the net.

DRIVE MAPPINGS allow NetWare managers and users to organize and label the different directories on the file server's hard disk so that access to the directories is easier to accomplish and understand.

Drive mappings are very similar to paths in DOS.

There are 5 local drives when using version 3.x of DOS. They are labeled A through E.

There are 21 available network drives that can be mapped to different locations in the directory structure. Each map command assigns a drive letter to the directory you specify. F through Z may be used to map to different network directories.

For example, if you Map F:=sys:public, whenever you are at the F prompt, you are in the sys:public directory.

Another type of drive on the network is a SEARCH DRIVE, also referred to as a SEARCH PATH. A search drive is set up using the map command. Search drives allow the network to access files located in directories other than the directory you are currently working in. Search drives are assigned numbers instead of letters in the map command. However, the system will automatically assign a drive letter to a search drive. The system uses letters starting with Z and working backwards in the alphabet as each search drive is assigned.

For example, if you Map S1:=sys:public, the system will assign the drive letter Z:.

Then, if you are at the H>, but need to execute a file in sys:public, you would not have to change to z: before accessing the file. The system will automatically search for the file through each directory that has a search path set up. Sixteen search paths may be set up.

NETWARE
MODULE 2--EXERCISE 1

In this exercise, commands are defined, and then the proper command format is given for you to execute the command. If you type the command and receive an error message, check to see that you used the correct command format and retype the command. If you are still not receiving the expected results, ask an instructor for assistance. Commands may be typed in uppercase or lowercase.

Get your username from your network manager or instructor.

MAP--assigns (maps) network drives to directories and displays such assignments (drive mappings).

Before you can work in a directory on the network, you must map a network drive to that directory. Mapping is often done by the network manager and is stored in a file called a LOGIN SCRIPT. The login script automatically maps you to the needed drives when you log in.

The following exercise will demonstrate some uses of the map command.

STEP:

1> LOGIN
2> Type: Map Press enter.

The system will display your drive mappings that have been set up by your network manager. It also displays any search drives that have been set up.

3> PrtSc
4> Cls

RIGHTS--displays your effective rights in the directory specified.

5> Type: Rights Press enter.

Notice that you have all rights in your home directory except parental.

6> Type: Map G:=Sys:Login Press enter.
7> Type: G: Press enter.
8> Type: Rights Press enter.

Notice the difference between your rights in your home directory and the Sys:Login directory. You have no rights in Sys:Login.

9> PrtSc
10> Cls

11> Type: Map G:=SYS:WP Press enter.

12> Type G: Press enter.

13> Type: Rights Press enter.

14> PrtSc

15> Type: H: Press enter.

This takes you back to your home directory.

16> Cls

UDIR--globally searches through a directory or directories for a specified file or files.

17> Type: Udir FS1/Sys:WP Press enter.

The screen will display any files in the Sys:WP directory.

18> Type: Map G:=Sys:Spr Press enter.

19> Type: G: Press enter.

20> Type: Udir Fs1/Sys:*.wks Press enter.

All files with the extension .wks will be displayed.

21> PrtSc.

22> Cls

LISTDIR OR SHOWDIR (Ask your instructor which command to use.)--displays the directory structure of a specified volume, drive, or directory; also displays the maximum rights mask and the time and date of creation for each directory below the one specified.

23> Type: Listdir Sys:Stu/Ail Press enter.

You will see a list of all of the Guest directories used for these modules.

24> PrtSc

25> Cls

Be sure that you are at the H> (in your home directory before continuing.

FLAG--displays or changes file attributes. If you need a review of file attributes, see the handout NETWARE SECURITY AND DIRECTORY STRUCTURE.

26> Type: Map G:=Sys:WP Press enter.

27> Type: G: Press enter.

28> Type: Flag Press enter.

All the files in this directory display with shareable read only file attributes.

29> Type: Flag *.* n Press enter.

The filenames display followed by "not changed".
You cannot reset the attributes because you do no have modify rights in this directory.

30> PrtSc

31> Cls

NCOPY--copies files from on directory to another; can be used with both network and local drives.

32> Type: ncopy *.* H: Press enter.

33> Type: H: Press enter.

34> Type: dir Press enter.

35> PrtSc

36> Cls

37> Type: Flag Press enter.

Notice that all files in your home directory are non-shareable read/write which is the normal or default file attribute.

38> Type: Flag *.* sro Press enter.

The screen will display each file name followed by the shareable read only file attribute. You can change file attributes in your home directory because you have modify rights in it.

To change the files in your home directory back to non-shareable read/write,

39> Type: flag *.* n Press enter.

You will see the new file attributes on your screen.

40> Type: Map Press enter.

Look at the screen to see which drive letter sys:public is mapped to. Switch to that drive letter.

NPRINT--sends a file to a network printer. The file must be in ASCIE format or it will print out as "garbage". You may be able to print a file created by an application program such as a word processing or database management system, but it will not print in the correct format.

41> Type: Nprint p.bat s=fs1 p=1 Press enter.

You will see a message:

Queing Data To Server FS1 Printer 1
FS1/Sys:Public
Queing File P.BAT

This small ASCIE file will print on network printer 1.

42> Type: Nprint supervis.mac s=fs1 p=2 Press enter.

Notice that a banner which identifies the user prints before the file prints. This banner identifies which user requested the print job, which is important when all users share network printers.

43> Type: nprint supercal.bat s=fs1 p=1 c=2 Press enter.

You will receive two copies of the file. In these commands S=fileserver name, P=network printer number, C=copies, and NB= no banner.

44> Go to your H>

45> Type nprint pcdosnet.doc s=fs1 p=0 nb Press enter.

46> cls

This file prints without a banner. Also notice that this file prints some "garbage" and that it is not formatted. The file pcdosnet.doc is a word processing file created with Multimate. The word processing codes are printed as "garbage" because nprint can read only ASCIE characters.

Another way to print on the network is to use the SPOOL and ENDSPOOL commands.

SPOOL--saves files so that they can be printed on network printers.

You must use spool when you cannot send a file directly to a network printer from the nprint command or from inside an application.

You also must us spool if you wish to use the Shift/PrtSc key to print the contents of your workstation screen on a network printer.

47> Type: Spool Press enter.

48> Type: Dir Press enter.

49> Press: Shift/PrtSc

50> Type: Endspool Press enter.

Your screen contents are sent to network printer 0 (the default printer).

ENDSPOOL--closes the print files saved with the SPOOL command.

51> Type: spool s=fs1 p=1 Press enter.

52> Type: Userlist Press enter.

53> Press: Shift/PrtSc

54> Type: Endspool

The userlist will print on network printer 1.

QUEUE--displays the print jobs in a printer's queue (along with the job sequence, job number, banner name, number of copies, form number, flags, station number, username, and time queued for each job.

Allows you to delete unwanted entries you have placed in the queue.

Displays spool information for a specific printer on any server.

55> Type: Q Press enter.

The list of files queued for printer 0 will display because we did not specify a printer.

56> Type: Q /p=1/s=fs1 Press enter.

The list of files queued for printer 1 will display because we specified printer 1 in the command.

NETWARE
MODULE 3 (OPTIONAL)

OBJECTIVE:

1. To practice using the NetWare menu utilities Session, Filer, Syscon, and Queue.

LEARNING ACTIVITIES

1. Complete the NetWare Tutorial program. Ask instructor for specific instructions. The tutorial program is on a microcomputer with a hard disk or is on your network.

Access the tutorial by going to the directory on which it is stored (ask instructor).

The tutorial is divided into four parts. They can be accessed by typing:
Tutor-1
Tutor-2
Tutor-3
Tutor-4

Other instructions you need are on the tutorial program itself. Follow the instructions given on your screen to complete these exercises.

NETWARE
MODULE 4

OBJECTIVES:

1. Describe the function of the NetWare Electronic Mail System.
2. Describe the electronic mailbox.
3. List and describe mail types.
4. Describe how to select mail by types, by source, and by date/time.
5. Define and demonstrate use of the following EMS (Electronic Mail System) commands.

   Check (define only)
   Close
   Edit
   List
   Help
   Open
   Put
   Read
   Remove
   Send
   View (define only)
   Quit

LEARNING ACTIVITIES:

1. Read the handout ELECTRONIC MAIL SYSTEM CONCEPTS.
2. Read the handout EMS COMMANDS. Keep this list for reference while completing the E-mail exercise.
3. Complete the E-mail exercise according to instructions given by your instructor.

EVALUATION:

Take the Netware Module 4 Test.

MODULE 4
ELECTRONIC MAIL SYSTEM CONCEPTS

Function:

The Electronic Mail System (EMS) provides a convenient way to compose, send, and file network mail.

The following keys may be used during command entry:

Backspace--deletes characters to the left of the cursor

Delete--deletes the character at the cursor

Keyboard arrows--move the cursor up, down, left, right

Escape, Control/C and Control/Break--erase the entire command, allowing you to start over

F3 key--Loads the command line with the previous command, which can then be edited.

The following keys can be used to scroll through text:
Up Arrow, Down Arrow, PgUp, PgDn, Home, End.

The Electronic Mailbox:

When a user is created on a file server, a unique, encoded mail subdirectory ("mailbox") is automatically created for him or her. Mailboxes are located in the directory Sys:Mail. The system remembers which mailbox is yours; therefore, you do not need to know the name of your mail subdirectory.

Rights: You have all rights except parental in your mailbox. You can open your mail and read it, remove it, forward it, or close it and store it for later use.

Mail from other users is automatically filed in your mailbox when you run the EMS. Network security allows other users to place new mail in your mailbox, but does not allow them to view or alter any other information.

Mailing large files:
Mailing large files is not recommended because this creates a duplicate of the file and it takes up space; therefore, send a short memo informaing users which directory to look in to find a large file that is for common use.

Mail Types:
Mail is classified according to its content or purpose. There are four types of network mail: FILE, DOCUMENT, LETTER, and MEMO.

Files, Documents, and Letters are standard DOS files that can be created by any program, iditor, or word processor.

Memos are created and maintained only with the EMS memo editor. Memos belong exclusively to the user who created them, and reside in that user's mailbox. A memo name is limited to eight characters.

Mail classification:

If you classify your mail by the following guidelines, you will be able to search your mailbox quickly for specific types of mail.

FILE-- Use for non-message oriented files, such as raw data files and binary image files.

DOCUMENT--Use for word-processed documents or text files.

LETTER--Use for message-oriented text files (usually lengthy or general purpose in nature).

MEMO--Use for relatively short messages addressing specific subjects.

When you identify an item of mail to be distributed, you should prefix the filename with the mail type--file, document, letter, or memo.

The default prefix is file.

Selecting Mail:

Most EMS commands let you select and work with items of mail through phrases called "search descriptions." Using search descriptions, you can select mail by type, source, date and time of mailing, or any combination of these criteria.

To select mail by type, simply specify the mail type.

Example: List "Documents and Memos"

To select mail by source, type:

Mail from sender (Use sender name)

To select mail by date/time, simply specify the desired information.

Time and date phrases are always keyed by one of the following words: Mailed, sent, dated, after, before, during, in on, or at.

The date may be specified by Year; Year and Month; or Year, Month, and Day.

The time may be specified in standard (12 hour) or military (24 hour) format, with or without reference to minutes.

MODULE 4
EMS COMMANDS

CLOSE--Use close to close open mail. The mail is taken off the list of open mail, but remains in your mailbox for later recall.

DIRECTORY--lists the files in a directory

EDIT--Use edit to create and edit your own memos.

LIST MY MEMOS--Use list my memos to list the memos that you have created.

LIST USERS AND GROUPS--Use list users and groups to list network users, groups, and members of groups or group combinations (so you know who will receive mail that you send to groups or group combinations).

OPEN--Use open to open mail for reading or editing.

PUT--Use put to copy mail from your mailbox to a normal DOS file. The DOS file can then be accessed, modified, or printed outside of the Electronic Mail System.

QUIT--Use quit to exit from the EMS and return to DOS.

READ--Use read to display a piece of mail in the Information Window.

REMOVE--Use remove to delete filed items of mail from your mailbox.

REMOVE MY MEMOS--Use remove my memos to delete memos which you have created.

SEND--Use send to send mail to other users or user groups.

VIEW--Use view to view the contents of regular text files (files that are not related to the EMS).

NETWARE
MODULE 4--EMAIL EXERCISE

Login using the login name given you by your instructor.

TO ENTER THE E-MAIL SYSTEM,

Type: Mail Press enter.

TO CREATE A MEMO, TYPE EDIT MEMONAME; for example, if you want to name the memo lunch type edit lunch

Give your memo a name up to eight characters.

Type: Edit Press enter.

The cursor will move to the top of the editing screen, and you can type the memo.

Type a short memo.

Press the F2 key to save it.

SENDING A MEMO TO ANOTHER USER

Now you are ready to send your memo to another user.

Type: Send memo to (Choose user currently on the network to send the memo to.)

You should also receive mail from someone doing this exercise.

OPENING MAIL

Before you can look at any of your mail, you must first open it.

Type: Open all Mail Press enter.

To list your open mail,

Type: List Press enter.

Once mail is opened,

Type: Read Press enter.

After you have finished reading your mail,

Type: Close all mail. Press enter.

TO PLACE YOUR MAIL IN YOUR HOME DRIVE in normal text file format,

Type: Open all mail Press enter
Type: List Press enter
Select a piece of mail to place in your home directory.
Type:
Put my memo to Sys:Stu/Guest#/Practice.mal

This will copy the memo you selected to your home directory and name the file practice.mal.

TO REMOVE YOUR MAIL

Type: Remove all mail. Press enter.

TO EXIT THE EMS

Type: quit Press enter.

TELECOMMUNICATIONS APPLICATIONS

INSTRUCTOR MATERIALS

NETWORK APPLICATIONS FOR THE OFFICE ENVIRONMENT

INSTRUCTOR'S GUIDE

TELECOMMUNICATIONS SYLLABUS

DESCRIPTION:

This module includes telecommunications program concepts and applications. Only an instructor's guide and syllabus is provided because the module should be conducted as a demonstration only.

PROCEDURE:

This module should be conducted as a series of instructor-led learning activities. Because the instructor must be a registered user of a communications service, students should not be allowed to have access to the communications service user i.d. name or password.

TEXTBOOK:

No textbook is required, but students should have access to the following books for prior reading:

The Complete Handbook of Personal Computer Communications by Alfred Glossbrenner, St. Martin's Press, New York, 1985.

Microcomputers and Applications by John Day, Thomas Athey, and Robert Zmud, Scott Foresman and Company, Glenview, Illinois, 1988.

Wordstar 2000 Plus Release 3 Reference Guide by MicroPro International Corporation, San Rafael, California, 1987.

CompuServe Information Service User's Guide by CompuServe Incorporated, Columbus, Ohio, 1988.

SUPPLIES AND MATERIALS:

Wordstar 2000 Plus Release 3 by MicroPro International

Private telephone line with a plug-in connector

Hayes-compatible modem (internal)

Registration with CompuServe Information Service (CIS)

OBJECTIVES:

1. Describe the need in an automated office for access to on-line databases through communications services.

2. Describe how to set up a control file for a telecommunications program within a word processing package.

3. Access a telecommunications program within a word processing package.

4. Prepare a message to send through a telecommunications program of a word processing package.

5. Access communications service to retrieve travel information.

EVALUATION:

Students need not be tested over the applications in this module.

TELECOMMUNICATIONS

INSTRUCTOR-LED DEMONSTRATION

LEARNING ACTIVITIES:

1. Students should read pp. 157-193 of The Complete Handbook of Personal Computer Communications for background concerning on-line databases or communications services.

2. Students should read pp. 200-218 of Microcomputers and Applications for background concerning telecommunications fundamentals.

3. Students should read pp. 419-431 of Wordstar 2000 Plus Release 3 Reference Guide for background concerning Telmerge, Wordstar's telecommunications program.

4. Instructor should demonstrate to students how to set up Telmerge.Sys, the file that controls the operation of the Telmerge utility (see pp. 432-434 of Wordstar 2000 Plus Release 3 Reference Guide).

5. Instructor should demonstrate to students how to add information about a supported communications service (i.e., CompuServe) to Telmerge.Sys file (see pp. 434-436 of Wordstar 2000 Plus Release 3 Reference Guide).

6. Instructor should demonstrate to students how to access communications service (i.e., CompuServe) to get information about travel services through the Official Airline Guide (OAG) database (see pp. 136-143 of CompuServe User's Guide).

7. Instructor should demonstrate to students how to send electronic mail through a communications service (see pp. 440-442 of Wordstar 2000 Plus Release 3 Reference Guide).

PRINTER APPLICATIONS

INSTRUCTOR MATERIALS

NETWORK APPLICATIONS FOR THE OFFICE ENVIRONMENT

INSTRUCTOR'S SYLLABUS

EPSON FX-85/286

DESCRIPTION:

This module includes concepts and terminology on operating the Epson FX-85 and FX-286 model printers. Different types of paper and typestyles will be presented with hands-on exercises for loading and printing documents using various features of the Epson printer.

PREREQUISITES:

No prerequisites are required.

PROCEDURE:

Give lecture and demonstration simultaneously. Print an example document using different typestyles available on the Epson and also demonstrate the printing options provided by the word processing software you are using. Demonstrate how to load different types of paper. Depending on the amount of equipment available evaluate students in groups or individually as they perform different tasks. Give students theory test. Included are some laboratory assignments, an example problem, and a theory test. Of course, you can create your own to accommodate your word processing software package.

TEXTBOOK:

No textbook is required. This module contains all handouts and exercises. Two manuals are recommended for reference as needed:

EPSON'S USER'S MANUAL, FX-286 PRINTER
EPSON'S USER'S MANUAL, FX-85 PRINTER

SUPPLIES AND MATERIALS:

Provide students with Epson Module, student syllabus, and reference manuals.

Provide students with an exercise disk.

Provide students with laboratory assignments.

Provide students with labels, paper, and ribbon cartridge (or just use the same cartridge).

OBJECTIVES:

The objectives of this module are to:

1. describe the process of how a document travels from the computer to the printer.
2. explain the parts/definitions and supplies of the printer.
3. explain the difference between letter and near-letter quality print.
4. present the different types of paper and how to load each into the printer.
5. discuss the features and printing enhancement capabilities of the printer.

COMPETENCIES:

At the end of this module the student will be able to:

1. list the main parts of the printer and their functions.
2. prepare a printer to receive documents.
3. load various types of paper in the printer.
4. print documents using different print enhancements/options.
5. replace the ribbon cartridge.
6. switch from draft mode to near-letter quality mode.
7. demonstrate how to load labels and different types of paper.
8. print documents using different typestyles.

NETWORK APPLICATIONS FOR THE OFFICE ENVIRONMENT

INSTRUCTOR'S GUIDE

EPSON FX-85/286 MODULE

The following problems were created with the MultiMate Advantage, Version 3.6 word processing software. You may have to create your own problems to accommodate your software program. Some applications programs are designed to control all typestyle functions. These programs may cancel all previous settings, and you may not be able to use the Selec Type functions. So it is very important to work out all your exercise problems.

These problems were created with the idea that students are in a Principles of Information Processing course. The instructor should create all problems on a disk and make each student a copy. You would only have to show the students how to boot the system. The students will just print these documents, so they would not need to know how to edit a document.

First develop a very simple demonstration problem where you can change the typestyles very quickly. For example:

Demonstration problem---Type the name of your college
Type the name of your department
Type the name of your city, state
Type the date

You may want to center the problem vertically and horizontally, with the body in double spacing. Print out the first copy with no typestyles, just using the standard defaults of the printer (or software).

Next print the problem in letter-quality mode.

Next print the same problem using the italic typestyle only.

Now print the same problem using double-strike and italic typestyles.

Print the same problem using double-width and emphasized typestyles. You may have to make some adjustments in the status line because each line cannot be wider than half the width of the paper. So your right margin cannot be wider than 42.

You can also use the same problem to demostrate how your software can change top margins and left margins, and any other printing options that are included in the software.

Be sure to cover all the printing options and typestyles the students will be using to complete their exercises.

THEORY TEST ON EPSON FX-85/286 PRINTER

MATCHING: Match the words in Column B to the descriptions in Column A. You will use each word only once. Worth four points each.

		COLUMN A		COLUMN B
_____	1.	This is a standard set of printer codes.	A.	Condensed Mode
_____	2.	These levers are used to install and move the tractor unit.	B.	Control Panel
_____	3.	This lever allows different thickness of paper or multiple copies to be inserted into the printer.	C.	Emphasized Mode
			D.	DIP switches
_____	4.	The Selec Type feature is located here.	E.	Tractor Release Levers
_____	5.	This mode prints 17.6 characters per inch.	F.	Print Head
_____	6.	Used on the FX-85 to print continuous-feed labels.	G.	Top-Of-Page Position
_____	7.	The element which contains the nine wires that strikes the paper and prints dots to form different characters.	H.	Paper Thickness Lever
			I.	ASCII
_____	8.	These switches control some important printer functions.	J.	Tractor Unit
_____	9.	This mode prints each dot twice (form of bold print).		
_____	10.	Tells the printer where the top of each page begins.		

TRUE/FALSE: Place a "T" for true and an "F" for false for each of the following statements. Four points each.

_____ 1. The Epson FX-85/286 is a dot-matrix printer with near-letter quality capability.

_____ 2. The print head will print about 100 million characters based on an average of 14 dots per character.

_____ 3. When you print a file to a disk, you cannot see any headers, footers, or page numbers on the screen. You have to wait until you print the document.

_____ 4. Use Selec Type feature to turn off the paper-out sensor.

_____ 5. Selec Type allows you to combine no more than two type-styles at a time.

FILL-IN-THE-BLANK: Fill in the necessary word or words to make the following statements complete. Four points each.

1. The three types of paper that you can use in the FX-85/286 are _____, _____, and _____.

2. A file can be printed to the _____ or _____.

3. A _____ is an area provided by the software application to store files in the order the printer receives it.

4. The FX-85/286 has two types of paper-feed systems: _____ _____ and _____.

5. In _____ mode the characters are more fully formed so that the characters look solid.

SHORT ESSAY: Use complete sentences to answer the following questions. Worth five points each.

1. List four things to consider when choosing a location for the printer?

2. List the things you can do to make loading paper into the printer easier?

3. Name two advantages the Epson printer has over a letter-quality printer?

4. Describe at least four functions provided by the control panel?

ANSWER SHEET FOR THEORY TEST ON EPSON FX-85/286 PRINTER

MATCHING: Match the words in Column B to the descriptions in Column A. You will use each word only once. Worth four points each.

		COLUMN A	COLUMN B
I	1.	This is a standard set of printer codes.	A. Condensed Mode
E	2.	These levers are used to install and move the tractor unit.	B. Control Panel
H	3.	This lever allows different thickness of paper or multiple copies to be inserted into the printer.	C. Emphasized Mode D. DIP switches
B	4.	The Selec Type feature is located here.	E. Tractor Release Levers
A	5.	This mode prints 17.6 characters per inch.	F. Print Head
J	6.	Used on the FX-85 to print continuous-feed labels.	G. Top-Of-Page Position
F	7.	The element which contains the nine wires that strikes the paper and prints dots to form different characters.	H. Paper Thickness Lever I. ASCII
D	8.	These switches control some important printer functions.	J. Tractor Unit
C	9.	This mode prints each dot twice (form of bold print).	
G	10.	Tells the printer where the top of each page begins.	

TRUE/FALSE: Place a "T" for true and an "F" for false for each of the following statements. Worth four points each.

T 1. The Epson FX-85/286 is a dot-matrix printer with near-letter quality capability.

T 2. The print head will print about 100 million characters based on an average of 14 dots per character.

F 3. When you print a file to a disk, you cannot see any headers, footers, or page numbers on the screen. You have to wait until you print the document.

F 4. Use Selec Type feature to turn off the paper-out sensor.

T 5. Selec Type allows you to combine no more than two type-styles at a time.

FILL-IN-THE-BLANK: Fill in the necessary word or words to make the following statements complete. Four points each.

1. The three types of paper that you can use in the FX-85/286 are single-sheet, continuous-feed, and green bar.

2. A file can be printed to the disk or printer.

3. A print queue is an area provided by the software application to store files in the order the printer receives it.

4. The FX-85/286 has two types of paper-feed systems: pin-feed system and friction-feed system.

5. In near-letter quality mode the characters are more fully formed so that the characters look solid.

SHORT ESSAY: Use complete sentences to answer the following questions. Worth five points each.

1. List four things to consider when choosing a location for the printer?

The answer is on page 6 of the Epson FX-85/286 Module.

2. List the things you can do to make loading paper into the printer easier?

   The answer is on page 11 of the Epson FX-85/286 Module.

3. Name two advantages the Epson printer has over a letter-quality printer?

   The answer is located on pages 12 and 13 of the Epson FX-85/286 Module.

4. Describe at least four functions provided by the control panel?

   The answer is located on pages 14 and 15 of the Epson FX-85/286 Module.

STUDENT MATERIALS

NETWORK APPLICATIONS FOR THE OFFICE ENVIRONMENT

STUDENT'S SYLLABUS

EPSON FX-85/286

DESCRIPTION:

This module includes concepts and terminology on operating the Epson FX-85 and FX-286 model printers. Different types of paper and typestyles will be presented with hands-on exercises for loading and printing documents using various features of the Epson printer.

PREREQUISITES:

No prerequisites are required.

PROCEDURE:

A lecture and demonstration will be presented. Students will read this module, then complete all laboratory assignments in the order given. Instructor will evaluate each student on operating the printer. Students will take a theory test.

TEXTBOOK:

No textbook is required. This module contains all handouts and exercises. Two manuals are recommended for reference as needed:

EPSON'S USER'S MANUAL, FX-286 PRINTER
EPSON'S USER'S MANUAL, FX-85 PRINTER

SUPPLIES AND MATERIALS:

Students will use the word processing software program provided by the instructor.

Student data disk also provided by the instructor.

Module on Epson FX-85/286.

Epson FX-85/286 printer.

Various types of paper and labels provided by instructor.

Laboratory assignments.

OBJECTIVES:

The objectives of this module are to:

1. describe the process of how a document travels from the computer to the printer.
2. explain the parts/definitions and supplies of the printer.
3. explain the difference between letter and near-letter quality print.
4. present the different types of paper and how to load each into the printer.
5. discuss the features and printing enhancement capabilities of the printer.

COMPETENCIES:

At the end of this module the student will be able to:

1. list the main parts of the printer and their functions.
2. prepare a printer to receive documents.
3. load various types of paper in the printer.
4. print documents using different print enhancements/options.
5. replace the ribbon cartridge.
6. switch from draft mode to near-letter quality mode.
7. demonstrate how to load labels and different types of paper.
8. print documents using different typestyles.

NETWORK APPLICATIONS FOR THE OFFICE ENVIRONMENT

STUDENT'S GUIDE

EPSON FX-85/286 MODULE

INTRODUCTION

In this module you will learn the concepts of how documents are prepared to be sent to the printer, the parts and supplies needed to maintain the printer, and the printing enhancement features available. This module will give you a basic understanding on how a printer operates.

Most places of employment will provide you with all the documentation you need in order to learn their software applications programs. When it comes to the printer, you usually just get a demonstration on how the printer works. It is very important to know the capabilities of your printer because it can make your job easier, and it can help you in deciding which software programs to purchase.

The printer used in this module is the Epson FX-85/286. This is a dot-matrix printer that recognizes a standard set of printer codes called ASCII (American Standard Code for Information Interchange). The FX-85 has a print speed of 160 characters per second, and the FX-286 has a print speed of 200 characters per second. The only major difference between the FX-85 and FX-286 is the number of columns wide each model can handle. The FX-85 is 80 columns wide but can be increased to 132 columns when in compressed mode. The FX-286 can handle up to 136 columns wide, and can be increased to 233 columns when in compressed mode.

Printing features of the FX-85/286 include near-letter quality mode, loads continuous-feed paper or single-sheet paper, nine special typestyles, an 8K buffer that lets you print a document while you work on another, and a dot graphics mode which allows the printer to produce pictures, graphs, and charts.

All of these features are possible if they are included in the software application package you are using. You can also print these features by using BASIC (computer language). This process is more involved, and you are actually programming the computer to accept certain print codes. Obviously, you have to know BASIC to be able to enter the print codes.

The Epson FX-85/286 is a dot-matrix printer with near-letter quality capability. The FX-85/286 uses a print head (element or font) that has nine pins or wires mounted vertically. As the print head moves across the page horizontally, it strikes the inked ribbon and presses the character on the paper. These characters are made up of dots. Depending on the character, the dots that make up that character are printed individually or in groups, or a combination of both. Each letter, symbol, or number takes approximately 1/160th of a second to print. Because the characters are not as solidly formed as in letter-quality printers, the Epson prints faster and produces what is known as a rough draft copy.

A. OBJECTIVES

The objectives of this module are to:

1. describe the process of how a document travels from the computer to the printer.
2. explain the parts/definitions and supplies of the printer.
3. explain the difference between letter and near-letter quality print.
4. present the different types of paper and how to load each into the printer.
5. discuss the features and printing enhancement capabilities of the printer.

B. COMPETENCIES

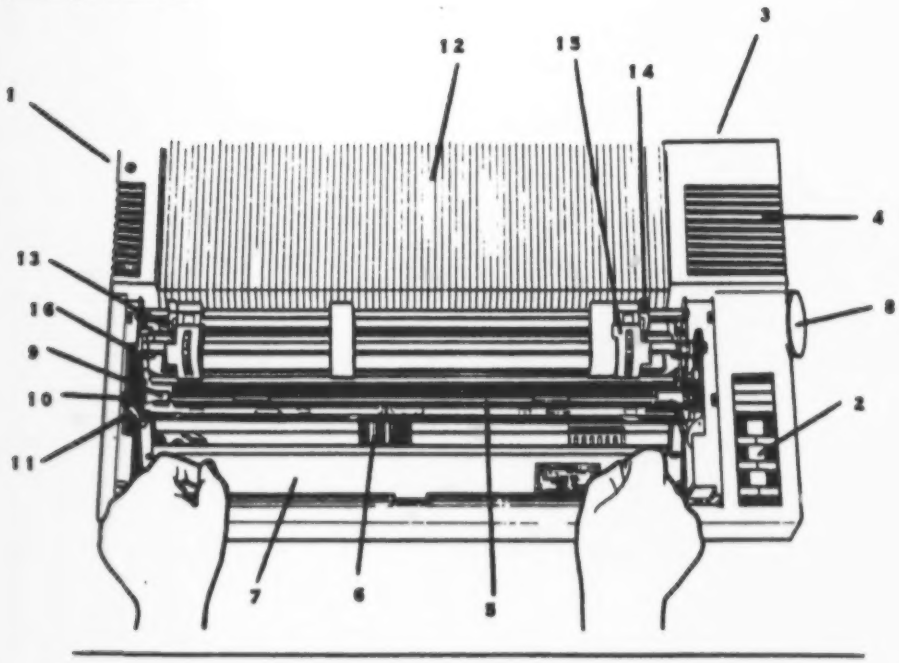
At the end of this module the student will be able to:

1. list the main parts of the printer and their functions.
2. prepare a printer to receive documents.
3. load various types of paper in the printer.
4. print documents using different print enhancements/options.
5. replace the ribbon cartridge.
6. switch from draft mode to near-letter quality mode.
7. demonstrate how to load labels and different types of paper.
8. print documents using different typestyles.

EQUIPMENT

A. Parts/Definitions

The printer parts are the:



SOURCE: EPSON FX-286 USER'S MANUAL, 1985, P. 1-6.

1. On/Off switch----turns the printer on or off and is located on the left side of the printer.

2. Control panel----allows the user to select the different typestyles, advances the paper one sheet or line at a time. It also indicates if the power is on, if the printer is ready, and if the user is out of paper. The control panel is located on the right lower corner of the printer.

   The control panel contains three buttons that are color coded. The left side is gray and the right side is blue. To activate the functions in gray, the printer must be off line. To activate the functions in blue, the printer must be on line.

3. Interface connector----The Epson-FX uses a parallel port (Centronics). A parallel connection allows 8 bits (one character) to be sent to the printer at the same time. The printer and computer are connected by a parallel cable which has 8 wires, one for each bit, to transfer information from computer to printer.

4. DIP switches (Dual In-line Package)----these switches are inside the printer and they control some important printer functions. They are located on the right corner of the FX-85 and the FX-286. You have to unscrew the cover to reach them. These switches are usually set by the factory to accept standard print codes, but the DIP switches can be changed to accept other codes. For example, if you wanted to print in a foreign language, you would have to change one or two of the DIP switches.

5. Platen----the black roller which provides a hard surface for the print head to hit against.

6. Print head----the element which contains the nine wires that strike the paper by printing dots to form different patterns, such as numbers, letters, symbols, and graphics.

7. Ribbon cartridge----the inked fabric ribbon used to print characters on the paper.

8. Paper feed knob----the knob located on the right side of the printer and used to help load single or continuous-feed paper into the printer. It is equivalent to the knob on a typewriter.

9. Paper bail lever----helps to keep the paper flat against the platen (black roller). It is located on the left and right end of the metal bar with the number scale on the FX-286. On the FX-85, you pull the metal bar up and out toward you.

10. Paper release lever----loosens the paper in the printer to make adjustments in loading the paper easier. It is the black lever located on the left side of the printer, next to the paper bail lever.

11. Paper thickness lever----allows different thickness of paper or multiple copies to be inserted into the printer. It is located in front of the paper release lever and has a "+" and "-" sign on top of the lever.

12. Paper separator----this helps keep the paper from curling around the platen and going back into the printer.

13. Pin-feed holders----sets the printer for the width of paper you are using. Use 9.5 for standard 8.5 paper. It is located above the beginning of the scale on the metal bar on the FX-85. On the FX-286 you release the locking levers to move the pin-feed holders so that the left edge of the paper is on zero on the scale.

14. Locking levers----the gray levers that release the pin-feed holders. Pull forward to release.

15. Pin-feed cover----the black levers that lay flat against the paper. They help keep the paper on the pin holders as the paper moves up. You pull the levers up on the FX-286. They are permanently installed on the FX-85 and just barely catches the edge of the paper when it is loaded.

16. Tractor release lever----the silver levers located right above the left and right paper bail levers. The tractor release levers are used to install and remove the tractor unit when using single-sheet paper.

B. Supplies

The Epson printer does not need many supplies. Some of these supplies or parts are very rarely replaced. Paper is what will be replaced most often. There are different weights and widths of paper, the standard weight is 18-20 lbs. of bond paper, and 8 1/2 inches wide.

The ribbon cartridge is about the only item besides paper that needs to be changed occasionally, and the number of pages a ribbon produces depends on the print enhancements you use. For example, if you use bold print, underline, or **shadow print**, you will use up the ribbon faster. Order the ribbon by the model number of your printer.

The print head and platen (black roller) are parts that need to replaced only if they are damaged or worn out. The print head will print about 100 million characters based on an average of 14 dots per character.

A print stand lets you put the paper underneath the printer and can help reduce the vibration noise. You can also purchase a plastic cover for the printer to keep dust from accumulating when you are not using the printer.

A small portable vacuum cleaner is helpful in cleaning out the lent and dust that accumulates under the ribbon cartridge. You can clean the outside of the printer by using clear water or a non-abrasive cleaner on a soft cloth to help remove stains.

C. Types Of Paper

There are basically three types of paper you can use in the FX-85/286, single-sheet paper, (such as letterhead), continuous-feed paper, and green-bar (used for spreadsheets) paper. All of these different types of paper can be purchased in different weights and widths, according to your printer's specifications. Green-bar paper is also available for the FX-85.

PREPARING THE PRINTER

A. Setting Up The Printer

One of the first things you should do in setting up your printer is to choose the right location. You may not have a choice because of how the room is designed, the location of the power outlets, or the length of the cable that connects the printer and computer.

If you do have a choice of location, you may want to keep the following tips in mind:

-----Place your computer and printer on a solid foundation. If possible, purchase a workstation designed especially for the computer and printer.

-----Do not place the printer directly on carpet, and use a grounded outlet, no adapters.

-----Keep your computer and printer away from the base unit for cordless phones.

-----Keep printer away from direct sunlight, heat sources, moisture, and dust.

-----Do not use the same circuit breaker as other large machines or appliances. If they cause a power failure, you may lose valuable information.

-----Stay away from controlled wall switches (one main switch that turns off the power in all outlets). Someone may accidentally turn off the switch.

Once you have chosen the best location for your printer, you can next check the printer itself:

-----Check the printer for proper settings for the size paper you are using, especially if the printer is used by others.

-----Make sure you have enough paper and that it will flow easily in and out of the printer.

-----Check the top-of-page position, and make any adjustments. Top-of-page position tells the printer where the top of each page begins. You can use the LF (line feed) button on the control panel to move the paper up one line at a time; you can also move the paper up manually by using the paper feed knob. Place the perforation line just below the top of the ribbon to set a standard top-of-page position on the FX-85/286. Once you determine where you want to set the top-of-page, you turn the printer off then back on again. This initializes the printer and erases all previous settings. The printer will remember the top-of-page position even when you use the FF (form feed) button to advance the paper one sheet at a time.

-----Check that the printer is on line and read to use.

B. Printing to the Printer or Disk

You can send your document straight to the printer to produce a hard copy. Most software programs allow the document to be printed to a temporary file in a buffer which then sends it to the printer. You can then work on other documents while a file is printing. When the document is printed, the temporary file is deleted.

A file can also be printed to a disk. Instead of seeing a hard copy, you print the file to the disk. It is usually given the same name but it has a different extension. For example, .PRT or .PRN extension.

When you print a file to the disk, you can recall the file and view how it will look when printed. You will be able to see headers, footers, page numbers, etc. Some software programs will allow you to print these files without copying them into a word processing program before printing.

C. Print Queue

A print queue is an area provided by the software application that stores files in the order the printer receives it. As a file is printed, the printer begins printing the next file on the list. The Epson FX-85/286 has an 8K buffer which helps free the computer to let you work on a file at the same time it is printing a different file.

LOADING THE PRINTER

A. Loading Continuous-Feed Paper

Continuous-feed paper is paper that is attached sheet after sheet and can be separated at the perforation mark. It also has holes on each side of the paper (which are torn off later) that fit onto the pin-feed holder so that paper can advance through the printer.

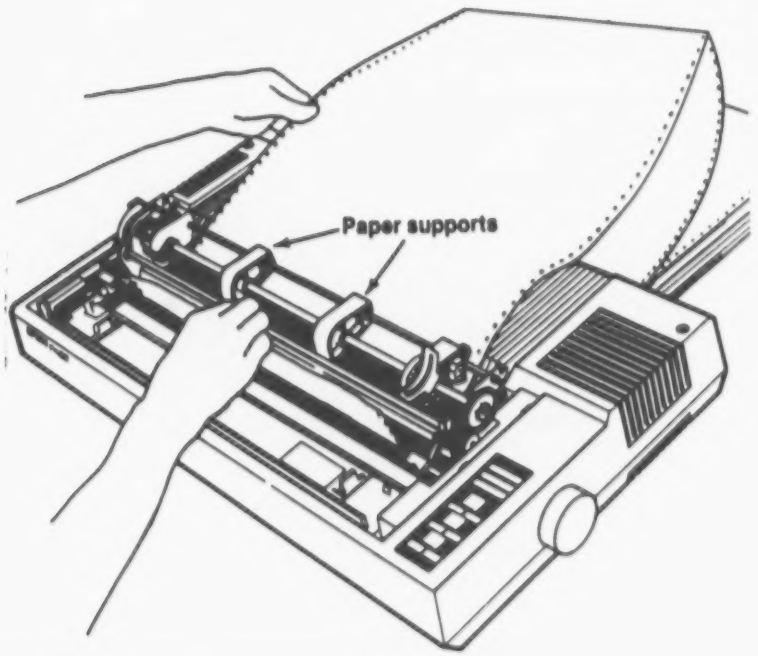
Follow the steps below to load continuous-feed paper into the FX-85:

1. Printer should be turned off.
2. Pull the gray locking levers forward to adjust the pin-feed holders for width of paper. Use the 9.5 setting for standard 8.5 paper. This allows for the tear-off strips at the edge of the paper.
3. Make sure you lock the pin-hold feeders in place by pushing the gray locking levers back.
4. Manually move print head to center of printer and pull the paper bail up and toward you, and pull paper release lever forward.
5. Sometimes by folding the first sheet on top of the second sheet, paper goes through the printer easier, especially if the paper is lightweight.
6. Next slide the paper in evenly until it stops.
7. Slowly turn paper feed knob until the paper catches on the pin-feed holders and you see the paper advancing upward.

8. As the paper comes around, push the paper bail back into position. This will keep the paper flat against the platen. Then check to see that the edges of the paper are under the black pin-feed covers.

9. Roll the paper up and set the top-of-page position. Remember to unfold the first sheet if you doubled the paper upon first inserting. Turning the printer of, then back on, will set the top-of-page position.

10. Be sure you push the paper release lever back in position. Your printer must be on line. The printer is now ready to print your documents.



SOURCE: EPSON USER'S MANUAL, 1985, P. 1-12.

Follow the steps below to load continuous-feed paper into the FX-286:

1. Printer should be turned off.

2. Manually move the print head to the center of the printer, and pull the paper bail forward.

3. Release the left and right locking levers by pulling them forward. This will allow you to move the holders to fit the width of your paper.

4. Open the black pin-feed covers and pull the paper release lever forward.

5. Insert the paper and push it through until you see it come around. Sometimes moving the paperback and forth makes it easier to pull the paper through. Check to see if the gray plastic paper supports located on the tractor bar are spaced evenly.

6. Pull the paper up one sheet and place holes on the pin-feed holder. Check what would be the edge of the paper (after you tear off the side edges) is even with the the first mark on the scale located on the paper bail. Then close the cover and push the gray locking lever back in position.

7. Move the right pin-feed cover to fit the width of the paper. Be sure there are no wrinkles and that the paper is straight by matching the pin-holes with the left side. Then close the cover and push the gray locking lever back in position. Sometimes you may have to pull the paper taut so that there will not be any slack below the paper bail.

8. Make sure the two black rollers on the paper bail are spaced evenly with the width of the paper.

9. Press the paper release lever back in place, and push the paper bail against the paper. Be sure the printer is on line. The printer is now ready to print your documents.

B. Loading Single-sheet Paper/Letterhead

The FX-85 has two types of paper-feed systems. The pin-feed system is used for continuous-feed paper, and it has holes on the edge of the paper that fits onto the pin-heads. As the pin-heads turn, the paper advances. The friction-feed system works just like a typewriter. It is used for single-sheet paper such as letterheads. You may have to change the dip switch that controls the paper-out sensor. On the FX-85 change switch 1-3 to on. See Parts/Definitions section number 4 for instructions. To load single-sheet paper into the FX-85, follow the instructions below:

1. Remove the continuous-feed paper and turn off printer.

2. Remove the paper separator cover.

3. Pull the dust cover forward and leave it in an up position.

4. Paper release lever should be in normal position.

5. Insert the paper until it stops. Roll paper feed knob clockwise until top edge of paper is right above the silver ribbon guide. You can straighten the paper by releasing the paper release lever.

6. Turn the printer on and print one page to see where the printer will break the page.

7. If the printer and the software break pages at different places, you have three choices:

-----Find the number of lines difference from where the page breaks and where you need the page to break. Then roll the paper into the printer for the amount of lines that you need at the top.

-----You can change the default page length through the installation procedure. Check your manual for instructions.

-----Some software programs allow you to change the page format of a document.

8. You are now ready to print. Remember to change the dip switch back to turn on the paper-out sensor.

The FX-286 also has the same two types of paper-feed systems as the FX-85. Remember to change the dip switch to turn off the paper-out sensor when loading single-sheet paper. To load single-sheet paper into the FX-286, follow the instructions below:

1. Turn the printer off and remove the tractor feed unit by pushing the tractor release levers forward, then tilt the unit back, and lift it up off the printer. Refer to the Parts/Definitions section number 16 for location of tractor release levers. (See picture below).

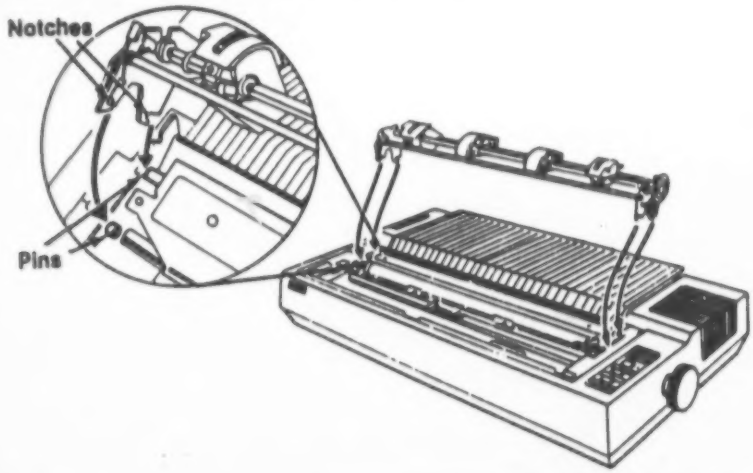
2. Push the paper release lever back, and pull the paper bail forward.

3. Insert the paper until it stops and then turn the paper feed knob clockwise until the edge of the paper is right above the silver ribbon guide. Push the paper bail forward to see if the left edge of the paper is aligned with the first mark on the paper bail scale. (You can also insert the paper sideways on the FX-286).

4. Print one page to see where the page will break.

5. If you need to reset the page break, follow the instructions on number 7 for loading single-sheet paper on the FX-85, page 8.

6. You are now ready to print. Remember to replace the tractor feed unit and insert the continuous-feed paper. Follow the instructions on how to load continuous-feed paper for the FX-286 on page 7. Remember to reset the paper-out sensor.



SOURCE: EPSON FX-286 USER'S MANUAL, 1988, P. B-4.

The items listed below can help make loading paper into the printer easier:

-----Check to see if the print head is at the center of the platen. If it is not, turn the printer off and manually move the print head.

-----Make sure the pin-feed holders are set for the width of your paper.

-----Check to see if there are torn pieces of paper jammed in the pin-feed holders.

-----If your paper is thin, you can double the first page, then insert into the printer.

C. Loading Labels

The FX-85 has an optional tractor unit that can be installed when printing continuous-feed labels. The tractor unit can print different widths of labels, and it helps keep the labels from sticking to the platen.

To install the tractor unit, (see picture on page 9) pull the dust cover up and toward you, and leave it in a standing position. Hold the tractor unit with the gears on the right side. Fit the notches over the pins and tilt the unit forward, and it will click into place. Follow the steps described for loading continuous-feed paper on the FX-286 on page 7.

The FX-85 can print continuous-feed labels without the tractor unit but the labels must be wide enough to fit over the pin-feed holders. Use the same procedures to load single-sheet labels that it takes to load single-sheet paper in the FX-85.

Load continuous-feed and single-sheet labels into the FX-286 that same way continuous-feed and single-sheet paper are loaded in the FX-286.

D. Changing The Ribbon Cartridge

To install a ribbon on the FX-85/286 follow the steps below:

1. Turn the printer off.
2. Lift the dust cover so that it remains standing.
3. Move the print head to the middle of the platen. Be careful, the print head may be hot if you have been printing.
4. You must tighten the ribbon on the cartridge before installing it on the printer. Turn the knob in the direction of the arrow.

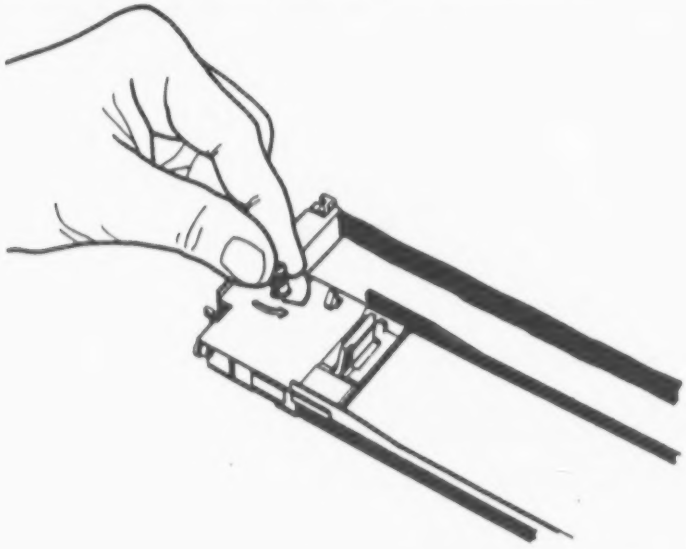
5. Pull up the plastic tab/s to remove the old cartridge. FX-85 has one long plastic tab in the middle of the cartridge, the FX-286 has two plastic tabs on top, one on each end.

6. Hold the cartridge by the plastic tab/s and lower the cartridge so that the two square pins at the end of the cartridge fit into the slots in the printer's frame.

7. You may need to use a pencil to place the ribbon between the silver ribbon guide and the print head.

8. Once the ribbon is in place, you may need to tighten the ribbon again.

9. You are now ready to begin printing. Be sure you turn the printer back on.



SOURCE: EPSON FX-286 USER'S MANUAL, 1985, P. 1-5

PRINT ENHANCEMENTS/PRINT OPTIONS

A. Typestyles

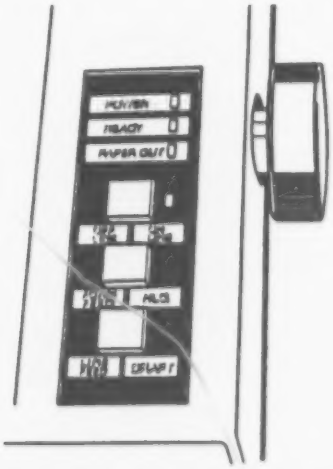
The FX-85/286 offers nine special typestyles or a combination of these typestyles to provide even more selections. The FX-85/286 as explained earlier is a dot-matrix printer. It prints out characters that are made up of dots. One advantage of a dot-matrix printer is that you can select different typestyles without changing the print head as you would on a Qume printer (letter quality printer).

Another advantage of the Epson is that it prints in draft-mode but also offers a near-letter quality mode (NLQ). In NLQ mode the characters are more fully formed so that the characters look solid. In NLQ mode it takes more dots to form the characters, therefore, it takes longer to print a document in NLQ mode.

The FX-85/286 has many more features that may not be available in the software program you are using. For example, international characters, designing your own characters, graphics, and seven density modes to help give graphics different shades of print. You can also change margins, line spacing, page length, and tabs to name just a few. The FX-85/286 even provides an IBM Proprinter mode by changing three dip switches. This will allow you to use an IBM character set.

The Epson mode offers a Master Select code which will allow any possible combination of seven typestyles modes. Most of these features are available through your software applications program or by using BASIC.

In this section we are going to discuss the printing features that are available through your word processing software program and the control panel on the FX-286. On the FX-286 the control panel has three buttons. Each button has two functions. The functions in yellow (OFF LINE, FORM FEED, and LINE FEED) are activated when the printer is OFF LINE. The functions in blue (ON LINE, NLQ, and DRAFT) are activated when the printer is ON LINE.



SOURCE: EPSON'S USER'S MANUAL FX-286, 1988, P. 1-16.

CONTROL PANEL BUTTONS

OFF LINE/ON LINE:

OFF LINE---If you press the ON LINE button when the green light above it is on, the ON LINE and READY lights go off and the printer is set off line, the power is still on but the FX-286 won't print. The FORM FEED and LINE FEED functions work only when the printer is off line.

ON LINE---The green ON LINE light indicates that the printer is on line and ready to receive data. If the READY light is also on, the FX-286 is ready to print. You may notice that the READY light flickers when the FX-286 is printing, but this is normal. When the FX-286 is on line, you can select either NLQ or draft modes.

FORM FEED/NLQ:

FORM FEED----Pressing the FORM FEED button advances the paper to the top of the next page if you're using continuous-feed paper. If you're using single-sheet paper, it fully ejects one sheet. The FORM FEED function works only when the printer is on line.

NLQ (Near Letter Quality)----Pressing the NLQ button selects the Near Letter Quality Typestyle. The printer beeps twice to acknowledge the NLQ selection. You can select the NLQ typestyle with the NLQ button only when the printer is on line.

LINE FEED/DRAFT:

LINE FEED----Pressing the LINE FEED button advances the paper one line at a time, either while you're loading paper, or when you're adjusting where you want printing to begin. If you hold the LINE FEED button down, the paper advances continuously. The LINE FEED function works only when the printer is off line.

DRAFT----Pressing the DRAFT button selects the draft typestyle. The printer beeps once to acknowledge the draft selection. The draft mode is also the default setting for the FX-286, so every time you turn the printer on, it's set to print in the draft mode. The DRAFT button works only when the printer is on line.

SOURCE: Epson FX-286 User's Manual, 1985, p. 1-17.

The control panel also operates the Selec Type feature which produces nine different typestyles. If your software program provides the same typestyles that the Select Type feature offers, use the software print options first. Your software may be programmed to cancel all previous typestyle settings which in turn would cancel the typestyle you selected through Selec Type. Use the Selec Type feature only if your software program does not provide it, or cancels the typestyle.

To operate the Select Type feature follow the instructions below:

1. The printer must be on and the POWER, READY, and ON LINE lights (green) must also be on.

2. Press the OFF LINE and FORM FEED buttons at the same time. You must hold these keys down for at least a second. The printer will beep once, the READY light turns off, and the ON LINE light begins flashing. (If the printer beeps twice, you are in NLQ mode. This happens because you did not strike the OFF LINE and FORM FEED buttons simultaneously. You have two choices: (1) You can press the OFF LINE button to put printer back ON LINE (the green light is on), then strike the DRAFT button. Then start over again by pressing OFF LINE and FORM FEED at the same time, hold down for about a second. (2) You can just turn the printer off, then back on again. This erases all previous settings, and puts the printer back on its default settings, which is draft-mode in pica pitch.

3. Once you have turned the Selec Type feature on (the ON LINE light should be flashing) press the OFF LINE button the number of times indicated in the mode column for the typestyle you want (Selec Type Chart shown below). Make sure you hear the printer beep the number of times needed.

4. Now press the FORM FEED button to set the typestyle.

5. Next press the LINE FEED button to turn the Selec Type feature off. This will leave the control panel with just the POWER light on. Now press the OFF LINE button once to set the printer back on line to receive data. You are now ready to print.

SelecType modes

Mode	Typestyle or Function
1	Condensed This is condensed mode
2	Double-width This is double-width
3	Elite This is elite mode
4	Emphasized This is emphasized mode
5	Italic *This is italic type*
6	Double-strike* This is double-strike mode
7	Underline This is underline mode
8	Superscript This is superscript
9	Subscript This is subscript
10	Skip-over-perforation

SOURCE: EPSON FX-286 USER'S MANUAL, 1985, P. 3-3.

SELECT TYPE MODES

Condensed mode----Selec Type offers a condensed pitch which prints 17.6 characters per inch. The default pitch for the Epson is pica (10 characters per inch).

Double-width mode----doubles the width of each character. Be sure the line you type is less than half a page wide or it will not fit. This is usually used for titles and headings.

Elite mode----prints 12 characters per inch.

Emphasized mode----prints each dot twice, the second one slightly to the right of the first (also known as bold print). The print appears darker.

Italic mode----prints characters that slant upward and to the right.

Double-strike mode----is another form of bold print. It prints the line, and moves the paper up slightly and prints the same line again. You cannot use double-strike with NLQ mode.

Underline mode----underlines characters and spaces continuously, unless your word processing software program provides underlining with spaces between words and numbers.

Superscript----prints characters slightly above the usual print line. For example, mathematical formulas and footnotes.

Subscript----prints characters slightly below the usual print line. You cannot use superscript and subscript simultaneously.

Skip-over-perforation----this will prevent the printer from printing characters on top of the perforation line, if the software program you are using does not provide this feature.

The Selec Type feature also has some restrictions. The entire file will be printed in the typestyle you select, not just an individual line or word. NLQ mode will not work when you select italic, condensed, double-strike, and elite. The emphasized mode will not work with condensed or elite. You cannot use subscript or superscript together. Select Type must be canceled after the document is printed. The printer will print all other documents in that typestyle until Selectype is turned off. To cancel Selec Type just turn the printer off, then back on.

Selec Type also allows you to combine typestyles (no more than two typestyles). Not all typestyles can be combined, you would need to check your manual. The Epson manual just tells you which modes will not combine with other modes.

The following is an example of combining the double-width and emphasized mode:

1. Printer must be on line (green light must be on).
2. Press the OFF LINE and FORM FEED buttons at the same time to turn on the Selec Type feature. The printer should beep only once. If it beeps twice, turn the printer off, then back on again, and repeat step two.
3. Now press OFF LINE twice to set for double-width mode (check typestyles chart), this selects the typestyle. Then press FORM FEED button once. This sets the typestyle.
4. Press the OFF LINE button two more times for emphasized mode to select this typestyle. Press the FORM FEED button once to set it. This makes a total of four times you pressed the OFF LINE button. Emphasized mode is number 4 on the chart.
5. Press LINE FEED button to turn Select Type off printer is now ready to print the document in the typestyle you selected. Next press the OFF LINE button once and you should see the green light turn back on. You can now send your document to the printer.

B. PRINT OPTIONS

Most word processing programs offer several print options that your printer will honor. Your printer may offer these options but you would have to enter them by using escape codes, or BASIC. The following items are just some examples of print options that may be included in your software program:

Printer selection----Lets you select which printer you want to use to print the docu-document. For example, an Epson printer may be used to print a fast rough draft, and a Qume printer to print in final letter-quality.

Paper----You can select single-sheet (letterhead) or continuous-feed paper. The printer will pause after every single-sheet is printed to give you time to insert the next sheet or to change the print head to print in another typestyle. Most software have continuous-feed paper as their default.

Number of pages----Lets you select which page/s to be printed. Some software allow you to select in a range. For example, you may want to print pages 2 - 4, 7, 9 -12.

Number of copies----Lets you select the number of copies you need of that document. Some software may have a limit set for the maximum amount of copies you can print at one time.

Page format----Some print options let you change the top margin, left margin, pitch, lines per inch, document page length, print the headers and footers on certain pages (all pages, even-number, odd-number), proportional spacing, and justification.

Disk file----You can print your document to a disk file instead of to the printer. You can view the document and it will look exactly like a hard copy.

Cancel printing----Printing can be canceled by pressing a certain key or keys. The printer will stop printing the document and you are usually back at your main menu. For example, in Multimate Advantage you press the control key and break key at the same time and then select 1 from the menu. In WordStar 2000 Plus you press the letter P and then choose whether to continue or abort printing.

Page layout----Documents can be printed so that they look framed, or can be printed along the length of the page.

LABORATORY ASSIGNMENTS

After a demonstration on operating the printer and how to set different typestyles, you will be given laboratory assignments. Please read the instructions carefully and if you have any questions ask the instructor.

TESTS

A. Theory

After all assignments have been completed, you will have a written test over the information in this module.

WORKSHOP MATERIALS

USING NETWORKS IN INSTRUCTIONAL ENVIRONMENTS

NOTES TO WORKSHOP LEADER:

The materials contained in this packet consist of Transparency Masters (TM) and Lecture Notes to accompany the transparencies. Handouts may also be made from the transparency masters.

Lecture notes are keyed to the workshop outline and the transparency master number.

NETWORK WORKSHOP OUTLINE

I. LAN Fundamentals

A. Definition

B. Why Network?

C. LAN Selection Process

1. Hardware

a. Servers

b. Transmission Techniques

c. Topologies

d. Cables

e. Access Protocols

f. Network Interface Cards

2. History of Hardware/Software Development

II. Novell NetWare Overview

A. Introduction

B. Comparison of NetWare 68, 86, 286 Systems

C. System Fault Tolerance

III. Advanced NetWare 286 V2.0

A. Operating System

B. NetWare Features

1. Distributed Processing
2. Directory Caching
3. Directory Hashing
4. File Cashing
5. Elevator Seeking

C. Directory Structure

D. Security

IV. System Manager and User Responsibility

V. Hands-On Exercises

A. DOS Modules (Review of DOS if needed)

B. NetWare Modules

NOTE: THE MODULES REFERRED TO IN ITEM V ABOVE ARE A PART OF "NETWORKING IN THE OFFICE ENVIRONMENT." THEY WERE WRITTEN FOR STUDENT USE IN LEARNING NETWARE CONCEPTS AND COMMANDS, BUT CAN ALSO BE USED AS A GUIDE FOR INSTRUCTOR WORKSHOPS.

LAN FUNDAMENTALS

I-A. Definition--A single physical communications link to connect two or more workstations enabling them to share hardware components, software, and data files. Configuration usually includes a file server, several workstations, several shared printers, and other peripheral devices.

B. Why Network?
To share:
- information
- application software (multiuser software)
- peripherals such as printers, modems, etc.

To set up and maintain security of files.

Electronic Mail systems are sometimes included.

C. LAN Selection Process

Go over TM-1 and TM-2

1. Hardware Go over TM-3 and TM-4

    a. Servers TM-5 (Notes below)

Disk Servers--TM-6

1. fool the workstation operating system into thinking it is accessing a local disk;
2. it is really using a disk shared by the network;
3. the workstations make direct calls to the shared disk

Disadvantages--

1. No shared file management
2. Single user applications only
3. data integrity hard to maintain
4. no record locking

File Servers--

1. centralizes file management with specialized software
2. software manages access to the disk and the files on it
3. built to handle sharing of files in a multiuser environment
4. true record locking
5. actual processing is distributed to PC's on the LAN

Print Servers--

1. Can actually be a file server also
2. In some networks, a print server can be any workstation

NETWORK WORKSHOP
LAN Fundamentals--Page 3
I-C-1.-b. Go over TM-7 and notes below.

Baseband--

1. Transmits one signal
2. easy to install
3. maintenance free

Broadband--TM-8

Disadvantages:

1. Encoded signal is combined with a carrier signal by a modem at the transmitting device and is converted back at the receiving device
2. Increased cost of broadband over baseband because of modems & transmission support systems.
3. Installation takes special equipment and expertise
4. Maintenance--it must be "tuned" to maintain data integrity and data transfer quality

Advantages:

1. exceptionally wide bandwidth
2. simultaneously supports data, video and voice transmissions
3. often used as a backbone

I-C-1.-c Go over TM 9 and notes below.

TM-9 These are four basic topologies. There are variations of each.

TM-10

Linear Bus Topology--
Devices are attached by stub cables.

Advantages:

1. simplicity--cable must pass by each network device; physical arrangement must be considered
2. cost--lower because less cable is used (compared to star)

Disadvantages:

1. If cable fails at any point, whole network goes down.

unless:
a daisy chain cabling scheme is used; it bypasses faulty stations

Star Topology--

1. arranged like a star
2. cables radiate from a central point
3. each cable is dedicated to a node
4. messages passed from central point to node

Advantages:

1. fault detection simple
2. failure affects only one workstation; LAN continues to function
3. good for frequent disk access operations because each has its own cable to disk

Disadvantages:

1. Uses more cable--bulky if workstations are arranged in a linear fashion
2. Cable is more costly

TM-12

Distributed Star--

1. Like star, uses dedicated cable to a central point
2. Central point is a connection box or hub rather than a file server.
3. hubs are attached to linear cables
4. messages are sent from central point to file server

Advantages:

1. easily adapted to arrangement of the installation site
2. especially good if stations are widely dispersed because inexpensive hubs are used with long linear lines between
3. combines the advantages of star and linear
4. dedicated cable--fault detection easy

TM-13

Star Wired Ring--

1. dedicated cables attach nodes to a wiring concentrator
2. network server is located elsewhere on the network
3. control messages are passed from workstation to workstation as in a ring topology

Advantages:

1. Fault detection is easy.
2. Dedicated cables

Go over TM-14

Go over TM-15 adding these notes:

Twisted Pair--
Other disadvantages include: interference from other devices is a problem, low transmission rates, and supports shorter cable runs

Go over TM-16 adding these notes:

Coaxial--
Other advantage includes: supports longer cable runs

Go over TM-17 adding these notes:

Fiber Optic--

1. Uses a glass fiber medium
2. Electronic pulse signal generated by a computer is converted into a light signal for transmission

Cable Access Schemes:

Most LAN's use a shared cable, but no two messages can be on the cable at the same place at the same time without colliding and destroying each other. Therefore, we must have a plan (a cable access scheme) to synchronize access to the cable.

TM-18

CSMA/CA = Carrier Sense Multiple Access/Collision Avoidance

CSMA/CD = Carrier Sense Multiple Access/Collision Detection

These are both contention schemes.

Characteristics of contention schemes follow:

1. Access is a first come first served basis.
2. Time between messages from a particular workstation can only be approximated.
3. When a workstation wants to transmit, it "listens" to the cable to see if it is busy.
4. If two or more transmit at the same time, their messages will collide.
   Then
   a. When the workstation detects a collision, it listens again until it hears no traffic and retransmits.

   b. The retry period is different for each workstation; therefore, it is unlikely that two will retry at the same time.

Inherent Problems with Contention Schemes:

1. Contention was designed for a situation in which network traffic is spread evenly among all stations.

This is appropriate for most office automation applications.

Problems with contention schemes, cont.

2. In most PC networks, all workstation network interface cards (NIC) talk to the file server network interface cards; therefore the file server card can get overrun with message packets. This depends on the network card used.

   a. Some NIC's lose packets and no message is sent to the workstation to tell the operator

   b. some NIC's have multiple receive buffers to overcome this

   c. some have an on-board processor which sends a message back to the workstation when the packet is received

Token Passing--is the other access protocol

1. message packet is called a token; it is passed from workstation to workstation until it receives a signal from one wanting to transmit.

2. That station receives the token and has control of the network.

3. Workstation transmits its data via the token. The amount of information that can be transmitted during one possession of the token is limited so all workstations share cable equally.

4. Is the standard access scheme in factory automation because it is possible to determine the amount of time between transmisssions from a particular workstation.

Network Interface Cards--Go over TM-19, 20, and 21.

I-C-2. History of Hardware/Software Development

Now that workshop participants have the background terminology for LANS, go over hardware components, software functions, and the development of network software that has affected the LAN industry. Suggestions follow:

Hardware--NIC, cables, servers, workstations, and disk drives, and other peripherals

Software--LAN software is the LAN operating system--the complete environment in which the network operates. LAN software controls file and record locking, security, print spooling, and electronic mail to mention a few.

Software developments that have affected the LAN industry:

1984--release of MSDos 3.1 and the IBM PC Network Program.

These were the first solid standards in the LAN industry.

Results:

1. Emphasis on LAN hardware disappeared
2. Industry recognized the LAN operating system (software) as the most important component
3. DOS 3.1 gave developers a standard for writing multiuser software that could run across a variety of LANS.
4. NETBIOS (Network Basic Input Output System) was an outgrowth of IBM PC Network; to be compatible, a network operating system had to emulate NETBIOS
5. DOS 3.1 and IBM PC Network confirmed the file server as the standard network operating system environment.

Go over Novell's Approach to LANS TM-22

Emphasize the different operating system shells available to run on different networks.

PRIMARY SELECTION CRITERIA

- Application (Need and Type)
- System Integration and Security
- Support and Training Requirements
- Current Equipment and Expertise
- Future Growth Plans and Layout
- Price and Performance

THE HARDWARE DECISION

- Current Equipment
- Current Cabling
- Characteristics of Architectures

TM-2
I-C-1-a

LAN HARDWARE

SECONDARY SELECTION CRITERIA

- Server Types
- Transmission Techniques
- Topologies
- Cabling
- Access Protocols

TM-4
I-C-1-a

SERVERS

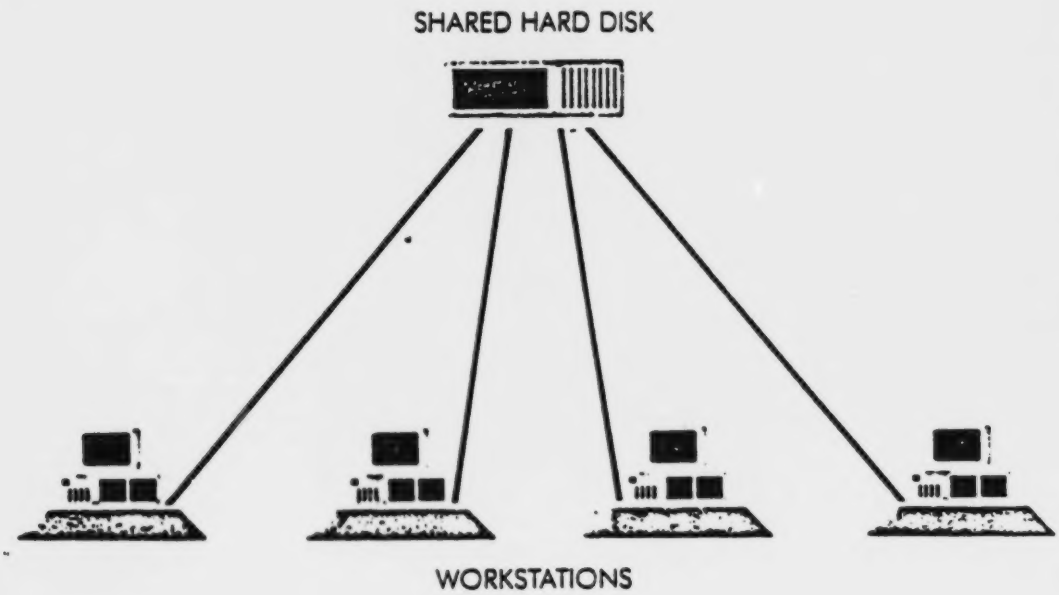
DISK

FILE

PRINT

TM-5
I-C-1-a

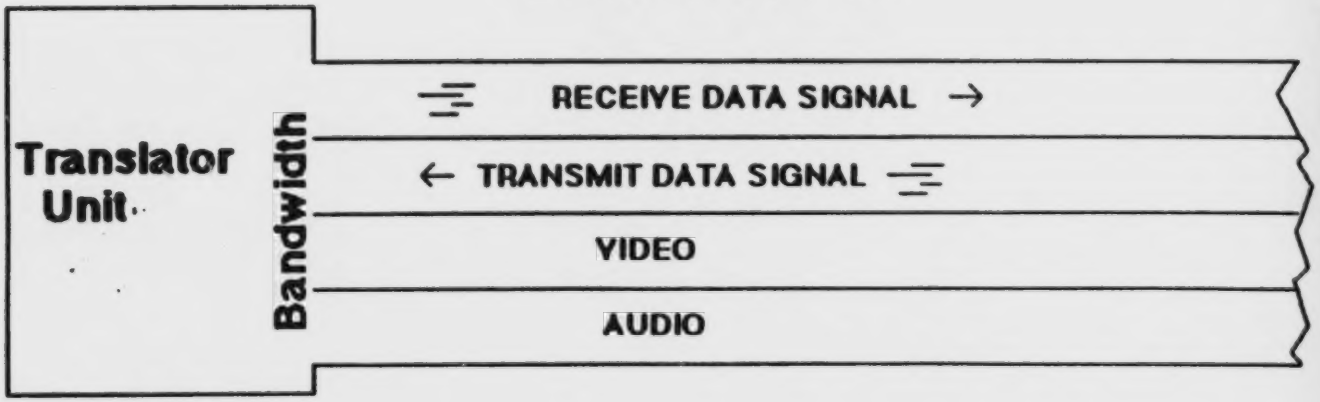
Disk Server Environment



TRANSMISSION TECHNIQUES

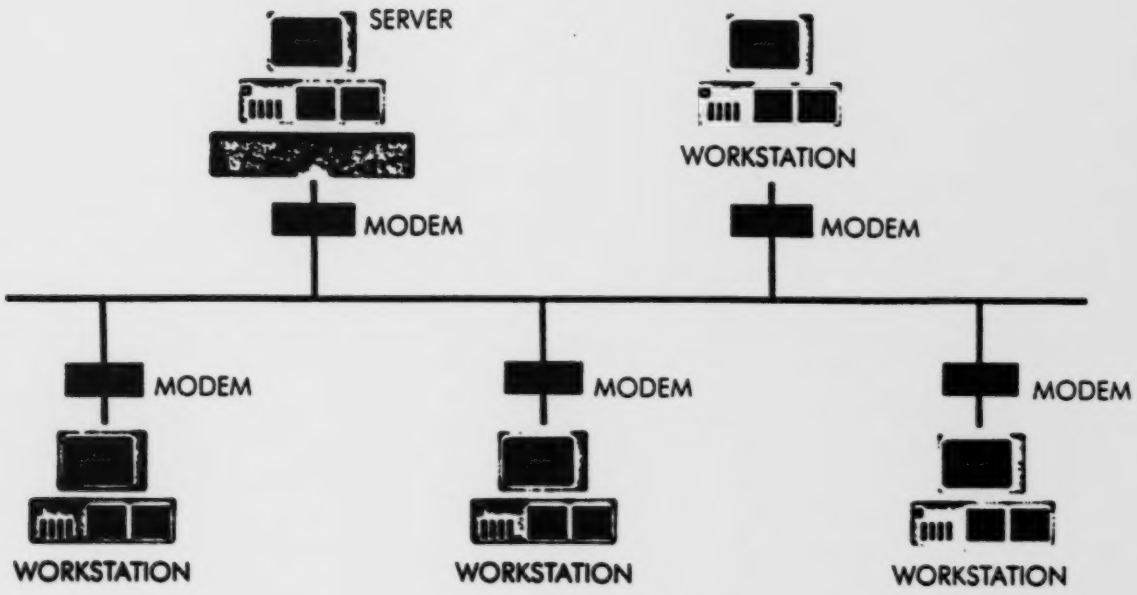
BASEBAND

BROADBAND



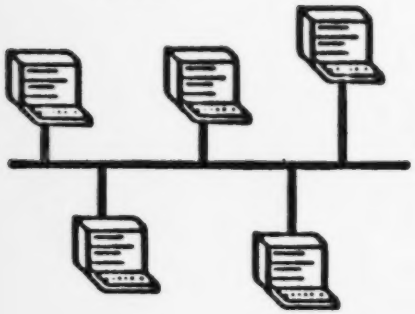
TM-7
I-C-1-b

Broadband Connection

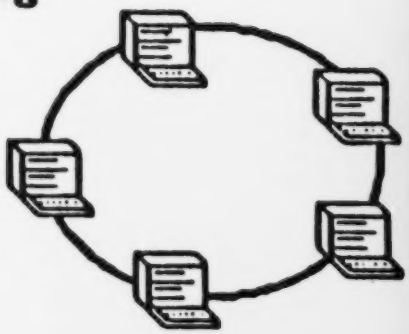


TOPOLOGIES

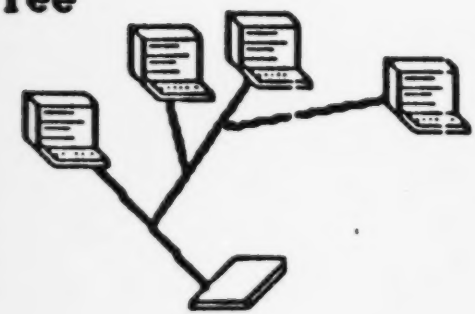
Bus



Ring

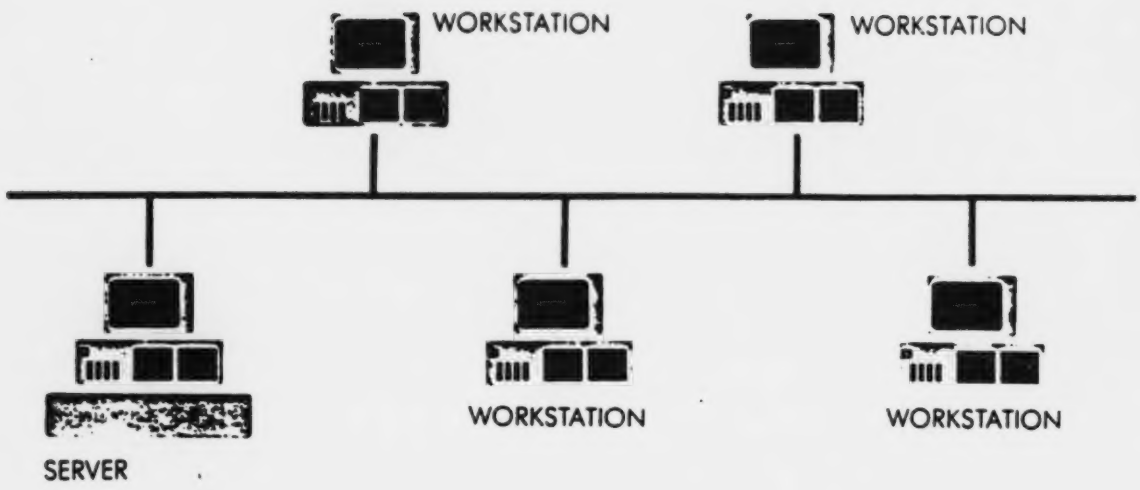


Tree

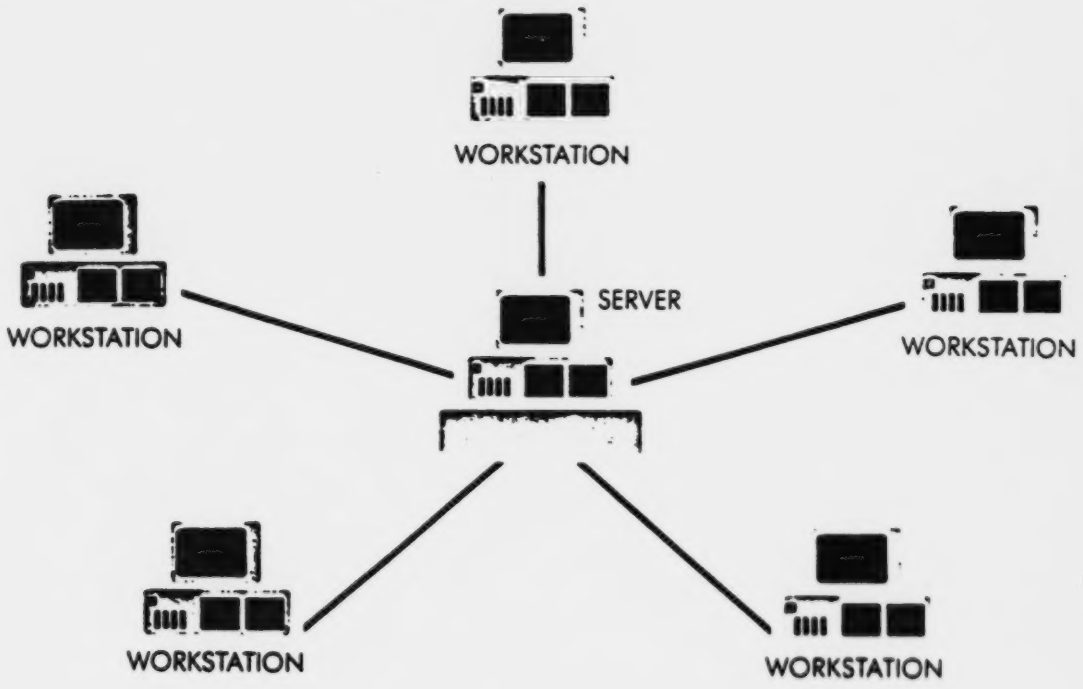


Star

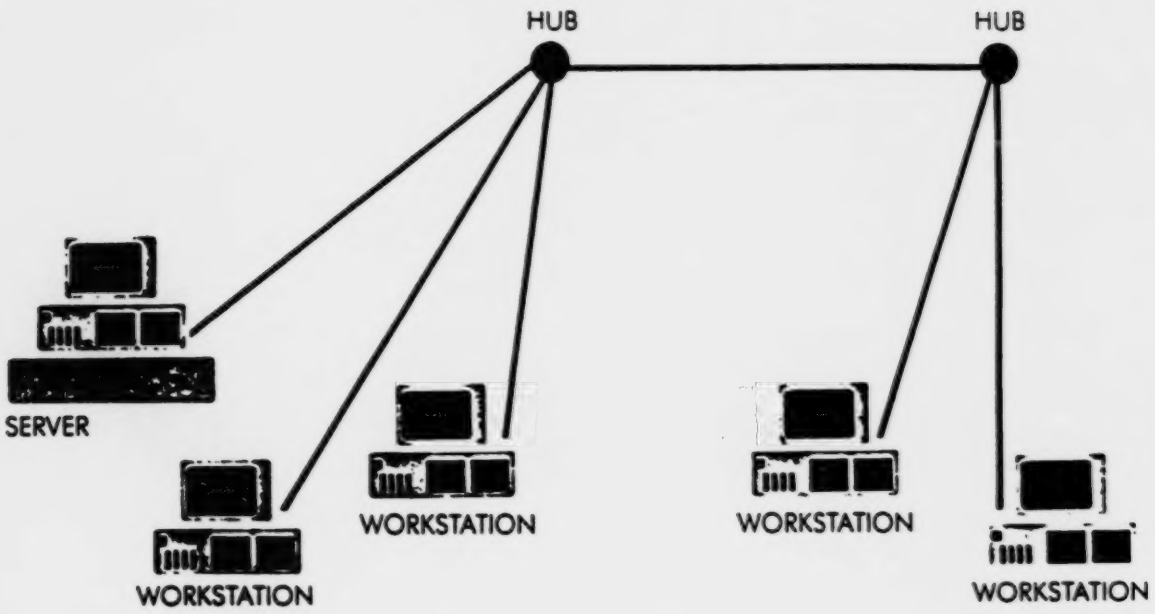
Linear Bus Topology



Star Topology

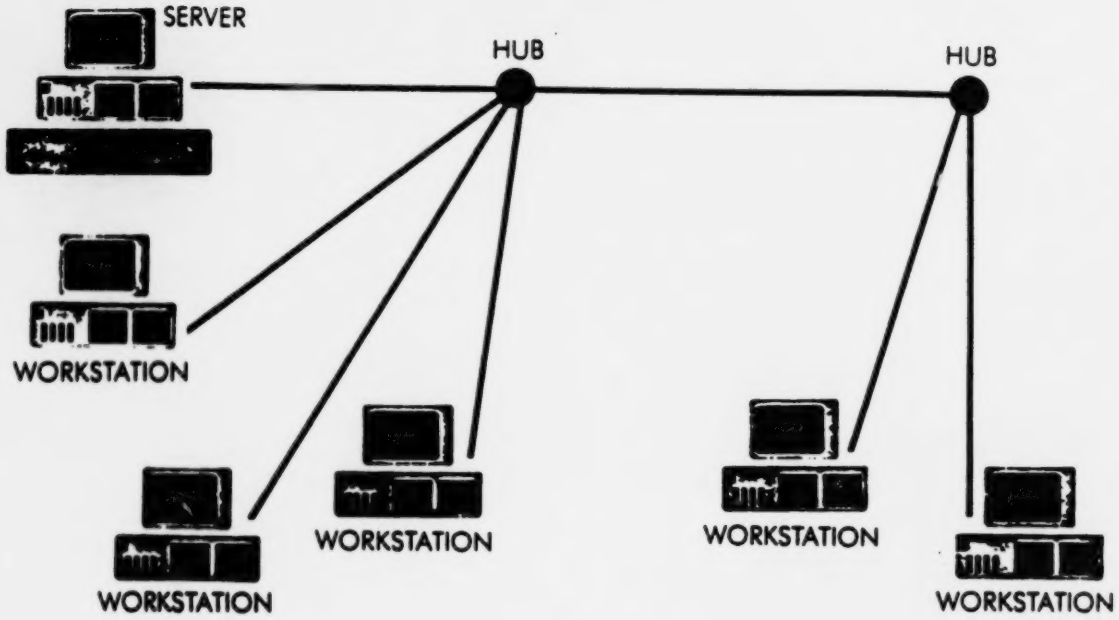


Distributed Star Topology



TM-12
I-C-1-c

Star-wired Ring Topology



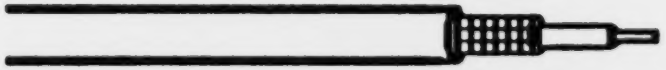
TM-13
I-C-1-c

CABLING TYPES

EASY TO INSTALL
GENERALLY SLOWER

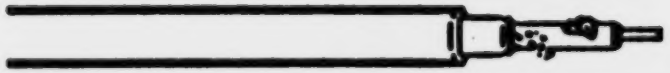
TWISTED PAIR

MOST COMMON
10MB SPEED
500KB BANDWIDTH



COAXIAL CABLE

RELATIVELY EXPENSIVE
1BB SPEED
3.3BB BANDWIDTH



FIBER OPTIC

Twisted-pair Characteristics

ADVANTAGES

*LOW COST
*EASY INSTALLATION
*USED IN TELEPHONE INSTALLATION

DISADVANTAGES

*NARROW BANDWIDTH

Coaxial Cable Characteristics

ADVANTAGES

*WIDER BANDWIDTH
*RESISTS INTERFERENCE

DISADVANTAGES

*HARDER TO INSTALL
*HIGHER COST

Fiber Optics Characteristics

ADVANTAGES

*EXTREMELY WIDE BANDWIDTH
*HARD TO TAP
*VERY DURABLE
*RESISTS INTERFERENCE

DISADVANTAGES

*VERY EXPENSIVE
*HARD TO INSTALL AND CONNECT

ACCESS PROTOCOLS

CSMA/CA

CSMA/CD

TOKEN-PASSING

NETWORK INTERFACE CARD

1. A circuit board that plugs into the expansion bus of a PC workstation.

2. Makes the physical connection between the PC and the network cable.

3. The NIC determines the cable access method.

4. Governs:

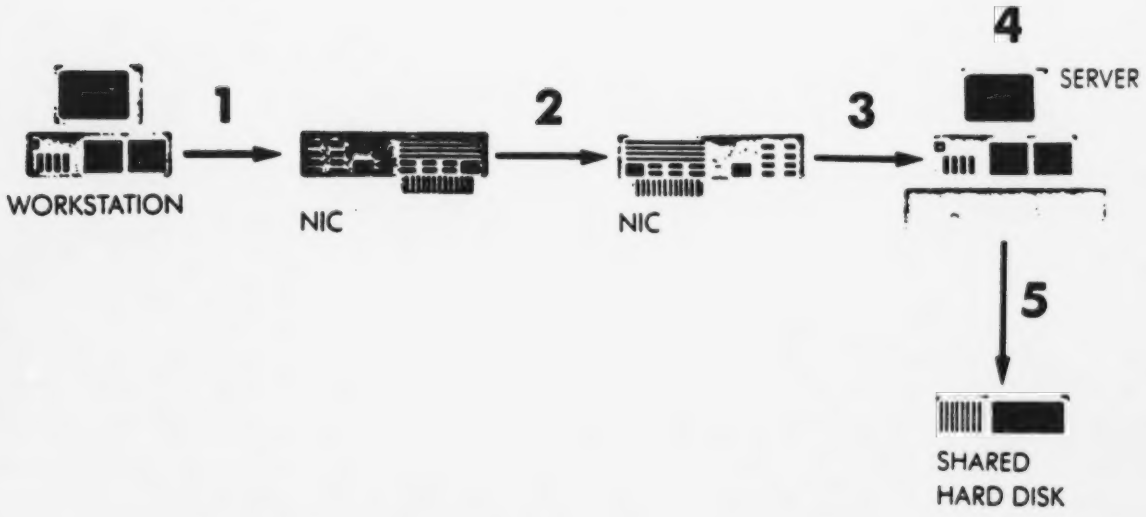
   a) data transmission rate,

   b) size of message packets; and

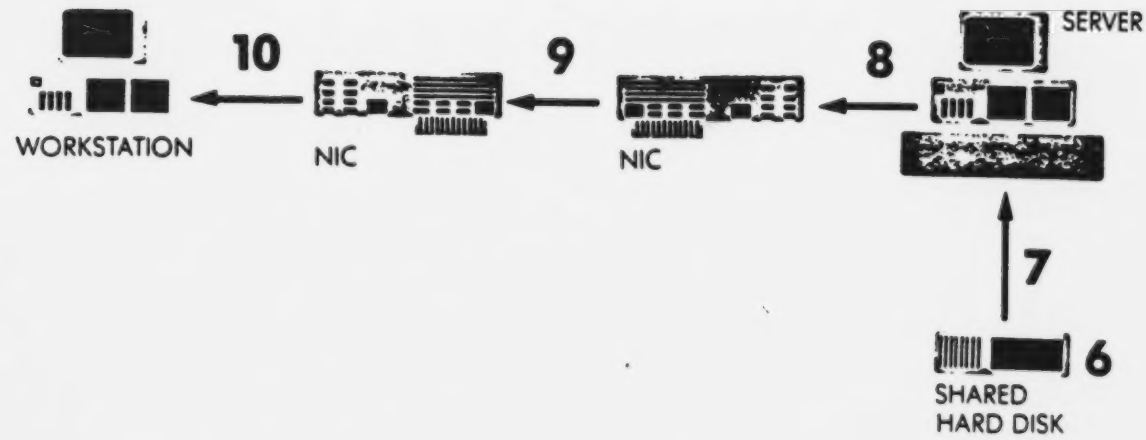
   c) message addressing information attached to each packet.

5. Determines topology of the network.

The Data Path for Requests



The Data Path for Replies



TM-20
I-C-1-f

If Hardware Were Standardized...
Then...

If all NIC's were same, it would mean that all would use the same

1) bit rate

2) access scheme

3) transmission type

4) topology

5) cable

However . . .

Each has its own advantage desirable for different applications as previously discussed.

Novell's Approach

Novell

1) manufactures and offers one type of LAN hardware.

2) resells hardware from other manufacturers

3) and supports them with advanced Netware (software)

Therefore . . .

1. All the hardware options could be interconnected through software bridges running in the file server;

2. No additional hardware is required.

Result. . . a standard of the

LAN industry

SECTION II
NOVELL NETWARE OVERVIEW

A. Introduction

The Novell Network links two or more personal computers (workstations) and other peripherals such as printers, disk drives, etc. to a file server. The network may consist of one or more file servers and several workstations. Shared printers or other shared peripherals are attached to the file server.

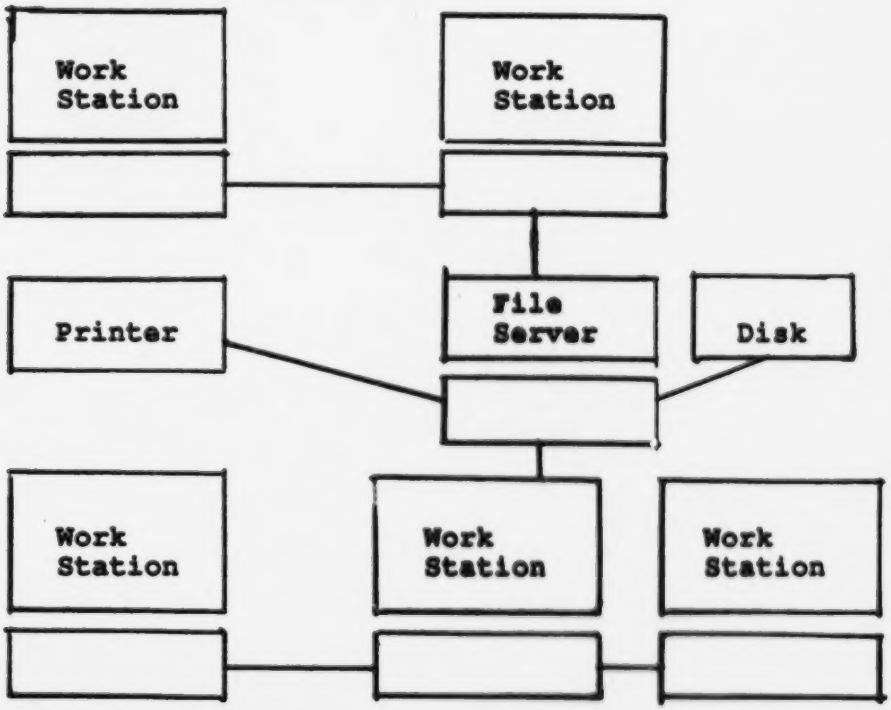
A TYPICAL NETWORK WILL CONSIST OF THE FOLLOWING EXTERNAL COMPONENTS:

File server(s)--manage network tasks

Disk subsystems--increase the file server's storage space

Workstations--the personal computer where user's work

One or more shared printers



THE INTERNAL HARDWARE COMPONENT OF A NOVELL LAN IS THE NETWORK INTERFACE CARD WHICH RESIDES IN THE NETWORK FILE SERVERS AND IN EACH WORKSTATION.

THESE CARDS ARE CONNECTED BY SOME TYPE OF CABLING.

B. Comparison of NetWare 68, 86 & 286 Systems

Novell NetWare can be expanded by adding memory boards, disk drives, and additional interface cards.

The comparison between systems which follows also includes a description of the expandability of each system.

	NetWare 68	NetWare 86	Netware 286
Server RAM Memory	1MB to 8MBs	640K	640K to 15MBs
Printers	5 serial, or 3 par., 2 ser.	3 par. 2 ser.	3 par., 2 ser.
File Servers	Novell NS68B	PC XT, AT & LOOK-ALIKES	NS286A, NS286B PC AT, & AT LOOK ALIKES
Total Addressable Storage	20MB TO 2 GB	10MB TO 252MB	20MB TO 2GB

Other expansion possibilities:

Disk Storage:

NDS4 Disk Subsystem--holds 4 disk drives or 3 disk drives and 1 tape unit.

NDS2 Disk Subsystem--holds 2 disk drives or 1 disk drive and 1 tape unit.

Bridges and Gateways:

Internal bridges--4 networks to 1 file server
External bridges--4 networks to 1 non-dedicated workstation
Remote and Remote+--network access through modem connection
ACS Gateway--modem sharing for all network users
SNA Gateway--SNA mainframe access for network users

C. System Fault Tolerance (Novell)

Definition--software or hardware used to protect files from corruption

LEVEL 1

Protects against media defects when writing to the hard disk.
Features "hot fix"

LEVEL II

Protects against disk failures.
Features:
Disk Mirroring--both drives are connected to the same controller card.
Disk Duplexing--connected to different cards, improves I/O

LEVEL III

Protects against disk/file server failure
Features Mirrored File Servers

SECTION III
ADVANCED NETWARE 286

A. Operating System--
The Novell Advanced NetWare uses two operating systems:

--Advanced NetWare on the file server:
controls the shared file server devices as well as execution of operating system commands

--DOS on the workstations:
controls the local workstation devices

These are two separate operating systems which are completely compatible with each other.

B. NetWare Features:

The following 5 features of NetWare contribute to its speed and efficiency.

1. Distributed Processing
2. Directory Caching
3. Directory Hashing
4. File Caching
5. Elevator Seeking

1. Distributed Processing--recognizes each workstation as a computer capable of executing its own applications. When a user requests a program or data file from the file server, it is downloaded to the workstation where processing takes place.

B. 2--TM-24

Directory Caching--stores the file server's directory entry table in memory; when a request for data stored on the hard disk is made, the file server uses the data stored in memory to find the address of the requested data. This is about 100 times faster than searching the disk would be.

B. 3--TM-25

Directory Hashing--indexes the directory entry table stored in memory (by caching). The system finds the correct address by examining only a few directories. Disk input and output is reduced by about 30%.

B. 4.--TM-26

File Caching--file server stores the most heavily used files in its memory. This works as follows:

1. When a file is first requested, it is stored in the file server's memory; it is sorted for subsequent requests.

2. The system monitors the file caching area and determines which files are used more than others. These are retained in memory while least used files are written over by new file requests.

File caching is 100 times faster than non cached files.

B. 5.--TM-27

Elevator Seeking--prioritizes buffers of I/O requests according to their disk addresses.

The requests are processed in the order in which they are found on the disk, rather than the order in which requests are made.

III-C--TM-31

Drive Mappings:

Drive Mappings allow NetWare managers and users to organize and label the different directories on the file server's hard disk so that access to the directories is easier to accomplish and understand.

Drive mappings are very similar to paths in DOS.

There are 5 local drives when using version 3.x of DOS. They are labeled A through E.

There are 21 available network drives that can be mapped to different locations in the directory structure of NetWare. Each map command assigns a drive letter to the directory you specify. F through Z may be used to map to different network directories.

For example, if you Map F:=Sys:Public, whenever you are at the F prompt, you are in the Sys:Public directory.

III-C--TM-32

Search Drives:

Another type of drive on the network is a SEARCH DRIVE, also referred to as a SEARCH PATH. A search drive is set up using the map command. Search drives allow the network to access executable files located in directories other than the directory you are currently working in. Search drives are assigned numbers instead of letters in the map command. However, the system will automatically assign a drive letter to a search drive. The system uses letters starting with Z and working backwards in the alphabet as each search drive is assigned.

For example, if you Map S1:=Sys:Public, the system will assign the drive letter Z:.

Then, if you are at the H>, but need to execute a file in sys:public, you would not have to change to z: before accessing the file. They system will automatically search for the file through each directory that has a search path set up. Sixteen search paths may be set up.

III-D--TM-33, & 34

NETWARE SECURITY AND DIRECTORY STRUCTURE

The four levels of NetWare Security are:

1. Login/Password
2. Trustee
3. Directory
4. File Attributes

LOGIN/PASSWORD security governs access to the file server. If either the login name or the password is typed incorrectly, the system will not log you in.

TRUSTEE and DIRECTORY security levels determine what you can do in a certain directory. For example, can you create files or only read existing files in a certain directory? The trustee rights and directory rights are set up separately. The eight rights that can be granted at these levels follow.

If you have...	You can...
Read Rights	Read files in that directory
Write Rights	Write to or change files
Open Rights	Open files
Create Rights	Create files
Delete Rights	Delete files
Parental Rights	Create subdirectories
Search Rights	Search the directory for files
Modify Rights	Change the file attributes

EFFECTIVE RIGHTS are those that you have at both the trustee level and the directory level. For example, if your trustee rights are read, write, open, create, delete, search and modify, but the directory rights are read, open and search, your effective rights would be read, open and search.

The directory rights, called the maximum rights mask, are set up by the network manager as are trustee rights.

FILE ATTRIBUTES determine what a user can do with a file. They include:

Read/Write	Shareable
Read Only	Nonshareable

If a file is read/write, you can read the file and write to it (change it).

If a file is read only, you can read it, but not write to it.

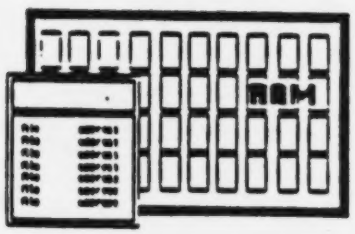
Shareable means that the file may be used by more than one user on the net at one time.

Non-shareable means that the file is not shared by other users on the net.

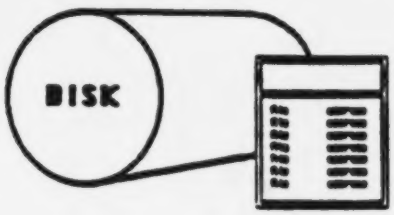
NOVELL ADVANCED NETWARE 286 2.0

TM-23
III

DIRECTORY CACHING

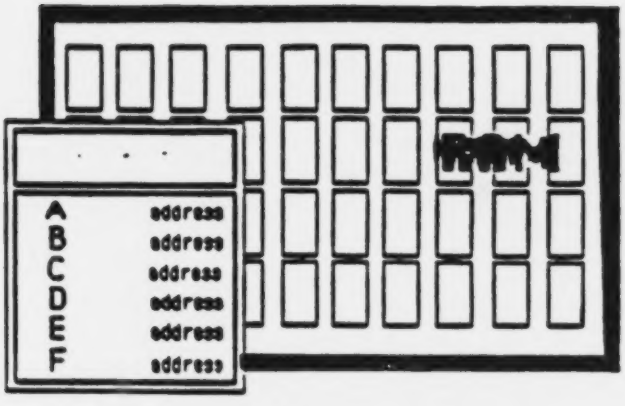


100 TIMES FASTER THAN DISK



TM-24
III-B-2

DIRECTORY HASHING

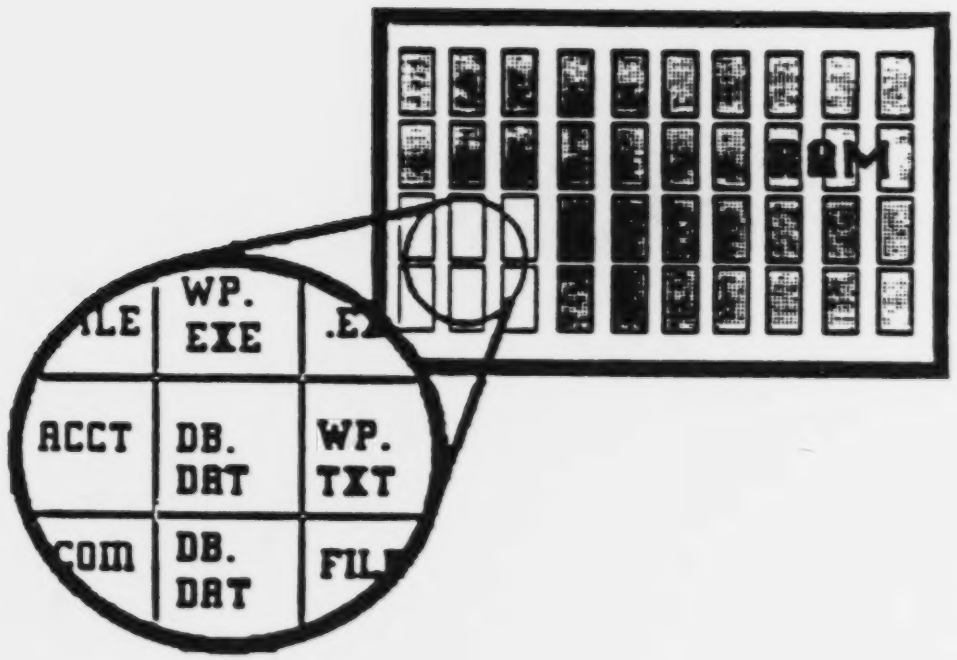


30 PERCENT FASTER THAN UNHASHED PROCESSING

TM-25
III-B-3

FILE CACHING

100 TIMES FASTER

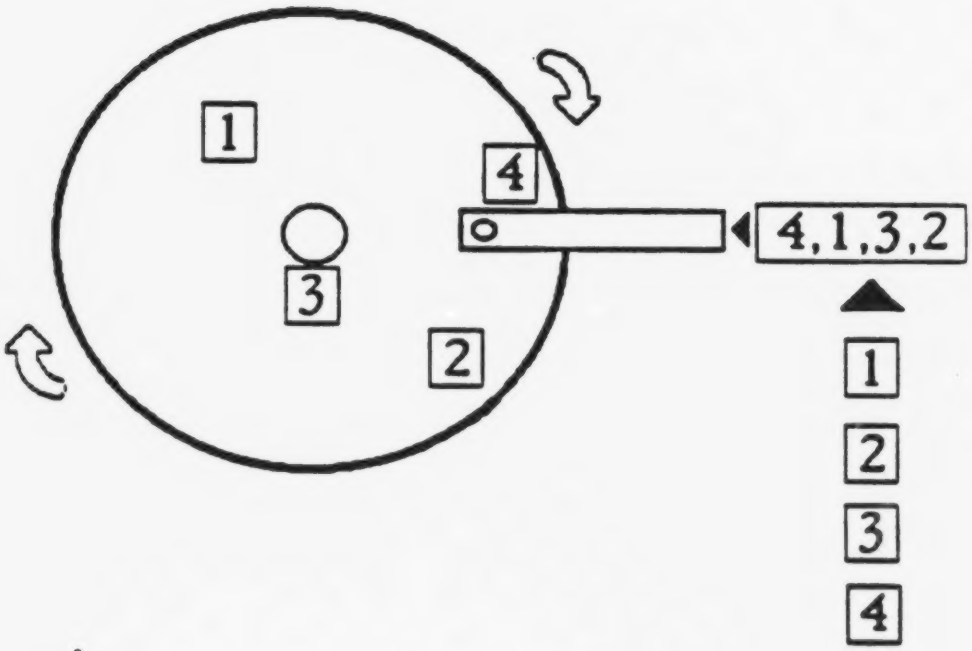


TM-26
III-B-4

ELEVATOR SEEKING

DISK OPERATION

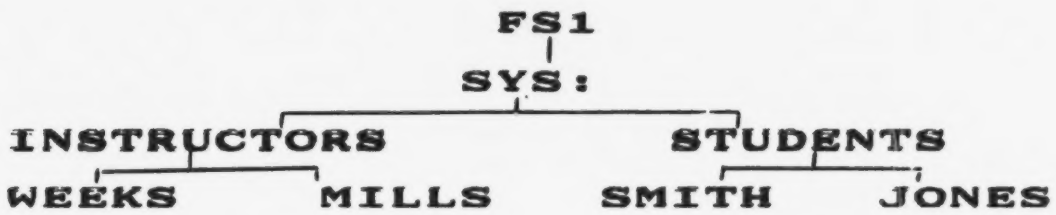
Speeds Disk access by 40%



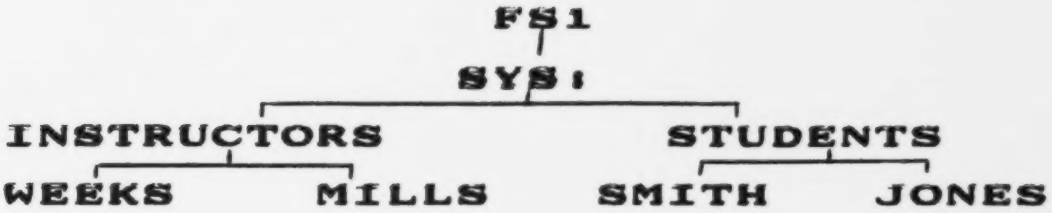
TM-27
III-B-5

DIRECTORY STRUCTURE

NETWARE USES A TREE TYPE DIRECTORY STRUCTURE SIMILAR TO THAT USED IN DOS. A FILE SERVER'S HARD DISK IS DIVIDED INTO VOLUMES, DIRECTORIES, AND SUBDIRECTORIES. DIRECTORY STRUCTURE REFERS TO THE HIERARCHY OF THESE PARTS.



TO ACCESS INFORMATION, YOU MUST SPECIFY EACH PIECE OF THE DIRECTORY PATH IN A DIRECTORY NAME.

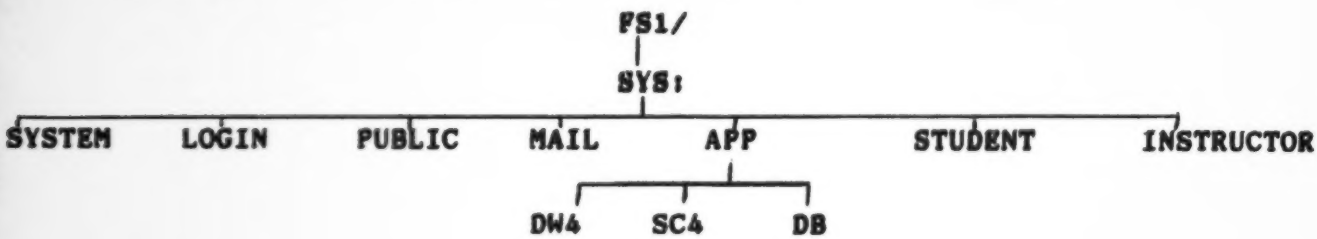


EXAMPLES OF NETWARE

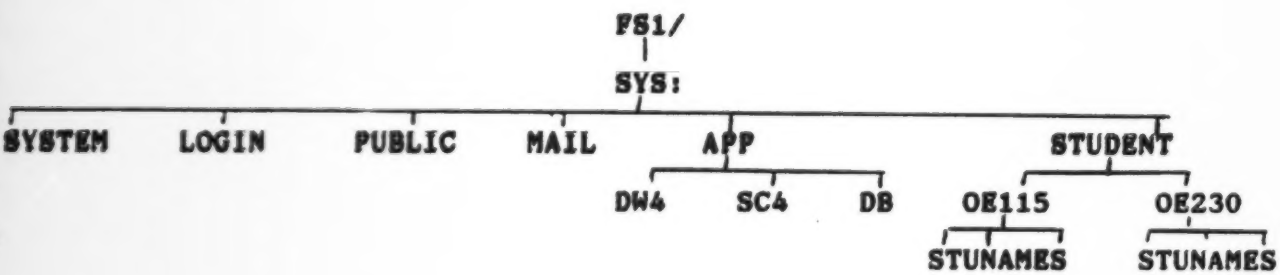
DIRECTORY STRUCTURE

YOU CAN ORGANIZE THE DIRECTORY STRUCTURE OF NETWARE TO SUIT YOUR PARTICULAR SITUATION. THESE ARE A COUPLE OF EXAMPLES.

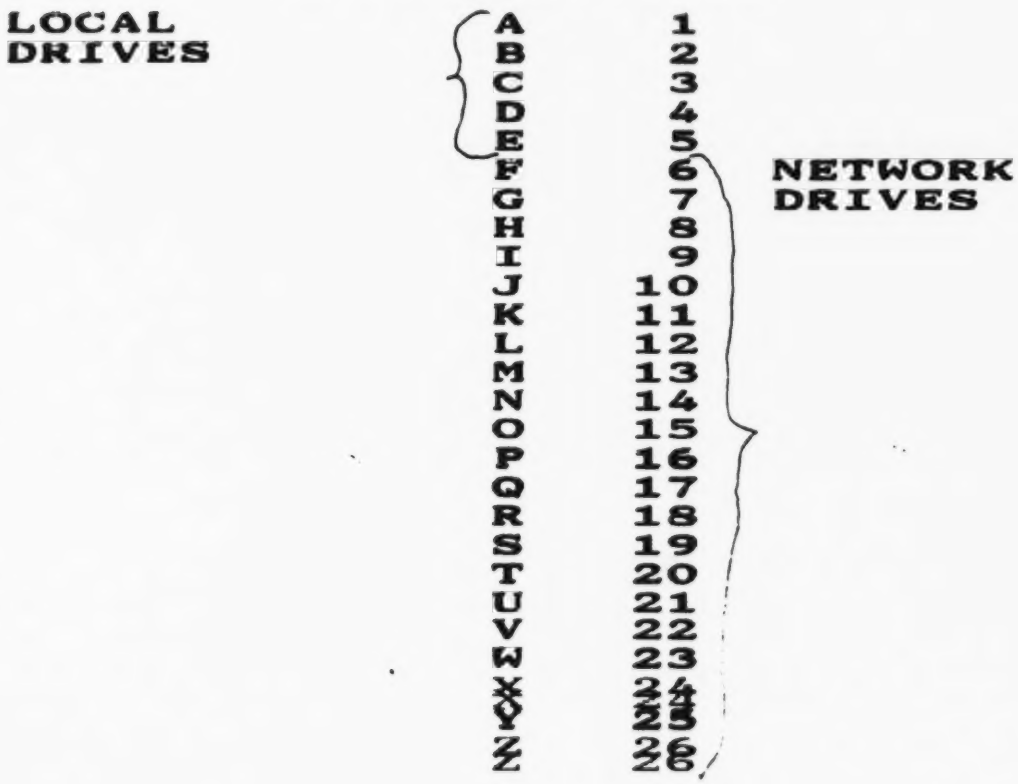
THIS STRUCTURE SHOWS A SUBDIRECTORY UNDER SYS: FOR APPLICATIONS SOFTWARE WITH A SUBDIRECTORY FOR EACH SEPARATE SOFTWARE PROGRAM. IT ALSO SHOWS A STUDENT DIRECTORY WITH A SUBDIRECTORY FOR EACH STUDENT USER AND AN INSTRUCTOR DIRECTORY WITH A SUBDIRECTORY FOR EACH INSTRUCTOR.



A VARIATION OF THE ABOVE SHOWS STUDENT'S SUBDIRECTORIES LISTED UNDER A COURSE NUMBER.



DRIVE MAPPINGS



DOS ASSIGNS A CERTAIN NUMBER OF DRIVES AS LOCAL DRIVES. DOS 3.1 ASSIGNS FIVE, A-E. F-Z MAY BE ASSIGNED AS NETWORK DRIVES.

DRIVE MAPPINGS

LOCAL DRIVES	A	1		
	B	2		
	C	3		
	D	4		
	E	5		
	F	6	NETWORK	
	G	7	DRIVES	
	H	8		
	I	9		
	J	10		
SEARCH DRIVES	K	11	16	
	L	12	15	
	M	13	14	
	N	14	13	
	O	15	12	
	P	16	11	
	Q	17	10	
	R	18	9	
	S	19	8	
	T	20	7	
	U	21	6	
	V	22	5	
	W	23	4	
	X	24	3	
	Y	25	2	
	Z	26	1	

FOUR LEVELS
OF
NETWORK SECURITY

1. **LOGIN/PASSWORD**
   Access file server

2. **TRUSTEE**
   Access directories

3. **DIRECTORY**
   Access directories

4. **FILE ATTRIBUTES**
   Access/work with files

FOUR LEVELS
OF
NETWORK SECURITY

1. LOGIN/PASSWORD
   Access file server
   - Username
   - Password

2. TRUSTEE
   Access directories

Read	Delete
Write	Parental
Open	Search
Create	Modify

3. DIRECTORY
   Access directories
   - Same rights as trustee

4. FILE ATTRIBUTES
   Access/work with files

Read/Write	Shareable
Read Only	Non-shareable

TO HAVE AN EFFECTIVE RIGHT, YOU MUST HAVE THE RIGHT AT THE TRUSTEE LEVEL AND THE MAXIMUM RIGHTS MASK OF THE DIRECTORY MUST ALLOW THAT RIGHT.

EFFECTIVE RIGHTS

Determined by intersection of trustee and directory rights.

RIGHTS	TRUST.	DIR.	EFFEC.
Read	x	x	x
Write	x		
Open	x	x	x
Create		x	
Delete	x		
Parental			
Search	x	x	x
Modify	x		

SECTION IV
RESPONSIBILITIES OF LAN MANAGER AND USERS

A. LAN Manager

1. Set up directory structure

2. Add new users to net; remove users as needed.

3. Set up and monitor security--maximum rights mask on directories and trustee assignments on users, file attributes of network files.

4. Add new software programs to the network; write batch files and revise enu as needed.

5. Give written instructions to users on network as changes affect them.

6. Provide training for a backup manager.

7. Monitor utilization of network to determine when to upgrade memory and/or disk space, add file servers, printers, workstations, etc.

8. Edit installation program periodically as needed to add printers to the network and to increase rthe number of directory entries as needed by users.

9. Remove any programs, subdirectories, or data files no longer needed.

10. Write login scripts as needed for different levels of users.

11. Test new software on the network.

12. Routinely back up file servers.

13. Perform routine maintenance and coordinate all vendor maintenance that is done on the network.

14. Provide a written record of problems encountered on the network--login problems, software problems, and hearware problems. (Sample forms follow these notes that can help both users and managers communicate these problems to each other.) Also provide the solution to the problems. This record helps users learn things they can do to avoid problems and helps managers remember how certain malfunctions were diagnosed and repaired.

15. Provide users a way to perform their work when the network is down. Written instructions for working standalone should be available as well as any disks needed.

B. User

1. Use programs and equipment according to instructions given.

2. Report any login problems, software problems, and hardware problems to supervisor/instructor so that these can be reported to the LAN manager. Write down any error message you received so that the manager will have a record of exactly what happened.

3. Display respect for the security of all user's data on the network and display a professional attitude toward other users working in the shared environment.

4. Inform the network manager when you add a subdirectory to the network structure so that he can maintain an up-to-date record at all times. (You would be adding a subdirectory only if given parental rights.) This also helps when the manager does a routine "clean up" of the disk; if he knows that a subdirectory is valid, it will not be removed mistakenly.

LOGIN PROBLEMS

Login Name	Password	Date	Completed

NETWORK PROBLEMS

FS #	Error Message or Description of Problem	Date	Action Taken

REFERENCES

1. ADVANCED NETWARE 286 REFERENCE MANUALS, by Novell, Inc.
2. LAN EVALUATION REPORT, by Novell, Inc., 1986.
3. SYSTEM MANAGER WORKBOOK, by O/E Learning, Inc., 1986.

GLOSSARY OF NETWORK TERMS

ACCESS The permission to perform certain functions on a network, usually controlled by the system manager. A user can be assigned access to read a file, write to or change a file, execute a program, or create directories and volumes on the shared devices.

ACCESS PROTOCOL The procedure or protocol used to gain access to a shared resource over the medium. Common access protocols are CSMA/CD, CSMA/CA token passing and Polling.

ACCESS SIGNALS Telephone voice is communicated by transmitting wave, rather than digital or alphanumeric, representations. These signals consist of wave shapes of different patterns to reflect the various qualities of, for example, the human voice.

BACKBONE The main cable segment of a bus network to which all other segments are connected through repeaters.

BANDWIDTH The differences, expressed in Hertz, between the highest and lowest frequencies of a band.

BATCH FILE A file containing a list of DOS commands that execute sequentially when the batch file is called. Such file names are named <filename>.BAT, and can be executed by typing the filename from DOS prompt.

BASEBAND The most common transmission technique. A single channel, serial transmission. At any point on the medium only one information signal at a time is present. It is easy to install and maintain, and therefore, is less expensive.

A type of LAN connection that can use coax or twisted pair or fiber optics. May use some form of Time Division Multiplexing. Only one message may be passing at any given time.

BRIDGE Equipment and techniques used to match circuits to each other, ensuring minimum transmission impairment. In local area networks, a bridge is a link between two or more dissimilar networks or systems. A bridge may be a high speed digital-switching mechanism that can buffer frames, perform transmission speed changes, and perform logical routing activity that is transparent to the nodes.

BROADBAND Transmission technique based upon the utilization of a broad frequency range, divided into sub-bands of narrower frequency. Communication between as many different groups of users as there are sub-bands may take place concurrently. Broadband transmission supports data, voice, video, etc., concurrently over longer distances than baseband. Broadband re-

quires the use of radio-frequency (RF) modems, and the networks are often more complex to install and maintain. Used by the IBM PC Network.

A type of LAN connection that uses coaxial cable and a large bandwidth for transmitting data. Data is transmitted using Frequency Division Multiplexing (FDM) techniques and can simultaneously transmit data, voice and video signals; Because of the transmission technique, signals will be analog, and must be translated from digital to analog and back for computer use.

BUS A bus topology has multiple nodes all connected to one single line or trunk that runs the length of the network. This topology is inherently resistant to failure because each node plays a passive role in transmissions on the line. This topology is also relatively easy to configure and expand.

BUS CONFIGURATION A topology (layout) of access to the network where a long cable is run and the devices tap into the cable.

CARRIER The presence of signaling on the medium.

CSMA/CD Carrier Sense Multiple Access with Collision Detection procedure that 1) allows multiple station to access the medium at will without explicit prior coordination, 2) avoids contention via carrier sense and deference, and 3) resolves contention via collision detection and retransmission. (CARRIER SENSE - each adapter is continuously monitoring traffic on the channel. MULTIPLE ACCESS - whenever there is a pause in the transmissions any node can begin transmitting. COLLISION DETECTION - if more than one node attempts to transmit at the same time, there is a collision of their signals. The collision will be detected by the computers and they will stop transmitting and wait for some random time interval before transmitting. The first to retransmit will gain control and others will wait for a clear channel.)

A good analogy for this is several people standing around having a conversation. If one person wants to speak and if nobody else is talking, the person simply begins to speak. If someone else is talking, the person waits for them to finish. If two people begin talking concurrently, they would both realize that they are interfering with one another, stop talking and wait a random period of time before resuming. Eventually, one person would begin speaking again, before the other, and gain the floor.

A technique that allows Multiple Access to the single cable carrying data; The devices sense a carrier signal which tells them whether there is a message already on the cable; Detects the collision between two messages simultaneously sent and re-transmits the data.

Basically: Device A looks at a signal called a carrier, and sees that there are no messages being sent on the cable, so it transmits a packet of information (the packet will be at least as long as it would take the signal to go the length of the cable and back. If Device B also begins transmitting, the signals collide, and the devices will sense the collision while they are still transmitting. Each device will then stop transmitting, and retransmit after waiting a random number of time slots.

CSMA/CA Carrier Sense Multiple Access with Collision Avoidance. Similar to CSMA/CD, however when a node wishing to transmit detects a pause in the transmission on the medium it waits a specified period of time, checks the medium again, and transmits if the medium is still clear.

CATV Community Antenna Television, used to refer to the broadband media transmission systems used with bus or tree medium access methods.

COAXIAL CABLE...COAX A widespread and moderately priced cable that has become a popular medium in LAN's because of its large capacity, low error rates, and configuration flexibility. Coaxial cable consists of a central carrier wire surrounded by fine copper wire mesh and/or an extruded aluminum sleeve. Materials like Teflon and PVC are used to position and insulate the carrier wire.

A cable with a solid wire insulated core and wire net on the outside all sheathed in an insulating cover. Essentially the same as cable TV cable.

COLLISION A condition caused by multiple overlapping transmissions on the medium, which results in garbled data.

CONTENTION An attempt by multiple data stations to simultaneously use a single shared resource, for example, the medium.

DATA PACKET A technique of sending data in a standard format with specified data at the beginning, followed by the data to be transmitted and concluding with a terminating set of data. For example, a packet would include a beginning with a message saying "here I come", who it is from, who it is to and what type of packet it is; Then comes the data up to some predetermined number of bytes - 46 to 1500, for example; At the end will be a CRC check number, terminating the packet. The packet will be a minimum length to allow for the CSMA/CD function to work.

DATA RATES The rate the data is transmitted over the medium. Usually expressed in Mbits or megabits per second (mega = 1 million). This number may be misleading. Ethernet, which transmits at 10 Mbits may have a lower thruput than a Novell

system that transmits at .5 Mbits because the system uses CSMA/CD and slows down when the number of active users goes up. Also, although the data rate may be height, the other units on the system may not be able to handle that high rate - like the interface board or file server.

DISK SERVER A device used in association with software that allows a disk to be shared, but does not provide for sophisticated file handling.

ETHERNET Among the first local area network schemes commercially available, Ethernet was unveiled commercially in the late 1970's as a method for connecting Xerox office products. The IEEE 802.3 standard essentially follows Ethernet: a 10-megabit-per-second baseband coaxial cable based local area network that uses CSMA/CD as an access control method.

FIBER OPTICS Optical fibers made of plastic or glass. Very high performance: Bandwidth of up to 3.3 billion Hertz vs. 500 million Hertz for coaxial, data rates of over one billion bps, very low error rates, unaffected by electrical or electromagnetic interference, very small and light. In fiber optic communications, electrical signals are translated into light pulses by a modulator, transmitted over the fiber by a light source, and detected and converted back into electrical signals by photoelectric diodes.

FILE LOCKING The ability of a software application, with the network, to deny access of a DOS file to other users, once one user has opened it for updating.

FILE SERVER A device used in association with the networking software that controls access to the disk and the files stored on it. Generally it gives the ability to protect files, records and even fields from unauthorized use.

FREQUENCY DIVISION MULTIPLEXING A broad frequency band is divided up into segments or channels that are used by a given device or for a give purpose

GATEWAY An entity operating above the link layer, which translates, when required the interface and protocol use by one network into those used by another distinct network.

A device for connecting one device to another. Usually meant as a method for connecting a LAN to a mainframe computer.

HERTZ A unit of frequency equal to one cycle per second.

HUB A device used to extend the number of devices plugged into a network. Sort of like a series of stars connected to a bus or to each other.

IEEE Institute of Electrical and Electronic Engineers. Among the primary duties of the institute is to develop industry standards. The IEEE local-network group, the Project 802 committee, decided to develop several different local-network standards. 802.3 is virtually identical to the Ethernet standard. The IBM Token Ring follows the 802.5 standard.

INTERFACE BOARD The Hardware interfacing component of the LAN system. There are three components of the system: The Workstation hardware - eg: an IBM PC; The Software component - the software that makes the network function as a unit; The interface component - the board that fits in the PC and connects to the network cabling system. Some networking software, like Novell, will work with many combinations of workstation and interface hardware.

ISO Standards The International Standards Organization issued a recommendation in 1978 for greater conformity in the design of communications networks and the control of distributed processing. The recommendation has gained wide acceptance in the form of a seven layer model for network architecture known as the ISO model for Open Systems Architecture. Each layer provides a certain subset of services to the overall network functions. The layers are handled by a combination of hardware and software. From lowest to highest level:

PHYSICAL LINK LAYER - defines the electrical and mechanical aspects of interfacing to a physical medium for transmitting data, as well as setting up, maintaining, and disconnecting physical links.

DATA LINK LAYER - establishes an error-free communications path between network nodes over the physical channel, frames messages for transmission in packets, checks integrity of received messages, manages access to and use of the channel ensures proper sequence of transmitted data.

NETWORK CONTROL LAYER - addresses messages, sets up the path between communicating nodes, routes messages across intervening nodes to their destination, and controls the flow of messages between nodes.

TRANSPORT LAYER - provides end-to-end control of a communication session once the path has been established, allowing processors to exchange data reliably and sequentially, independent of which systems are communicating or their location in the network.

SESSION CONTROL - establishes and controls system-dependent aspects of communications sessions between specific nodes in the network and bridges the gap between the services provided by the Transport layer and the logical functions running under the operating system in a participating node.

PRESENTATION CONTROL - encoded data that has been transmitted is translated and converted into formats which enable display on terminal screens and printers that can be understood and directly manipulated by users.

APPLICATION/USER LAYER - services are provided that directly support user and application tasks and overall system management (ie, resource sharing, file transfers, remote file access, database management, and network management).

LAN **Local Area Network** - A single physical communications link to connect two or more workstations within a single organization, enabling them to share hardware components, software programs and data files. The geographical constraints eliminate the need to use common carrier facilities, thus increasing the data transfer capacity of the LAN by allowing economical data transmission rates of many millions of bits per second. LAN's elude precise definition because they can be designed with a rich variety of technologies and arraigned in different configurations.

A Local Area Network. A technique of linking several devices within a limited area - usually a single building. This does not preclude attaching more remote devices, or extending the LAN or linking LANS together.

MEDIUM (MEDIA) Transmission media provide the physical channel used to interconnect nodes in a network. Media classified as **bounded** - wires, cables, optical fibers; or **unbounded** - radio, microwave, infrared.

MODEM Modulator Demodulator. A device that converts computer (digital) data to voice (analog) signals and back again.

MULTIUSER The ability for more than one user to have access to, and affect the same data concurrently without data corruption.

MUX Multiplexor. A device that takes several signals and combines them into one signal for transmission over a single line. At the other end another multiplexor will uncombine the signals.

NETBIOS IBM Network Basic Input/Output System. IBM's standard

for controlling the networking system. Bound to be a standard emulated by other LANs.

NODE The basic information processing units that are directly connected to the network-single addressable units. Usually intelligent workstations (like PC's) but also servers and printers.

A device attached to a networking system.

NOVELL A company that makes a popular networking software. This software works on many other vendor's hardware boards, and may become the MS-DOS of the LAN world.

OPEN CIRCUIT A broken or unconnected electrical path that does not conduct current.

PACKET Whole messages divided into discreet, uninterrupted units of data. They can be of fixed or variable length, but generally have a specified maximum length (ie., 128 bytes). Packets usually contain bits for synchronization, control information, message number, destination and source addresses, acknowledgement, error checking, and the data itself.

PACKET SWITCHING The process by which packets are placed on the channel and travel across the network to their destination.

PASSIVE Contains no active components, i.e. logic or amplification circuitry.

PBX Public Branch Exchange. A local telephone exchange used to switch calls around some local site. Is sometimes used to switch data as well. Some PBXs are currently being designed to handle both analog (voice) and digital (data) information.

PEER NETWORK Each computer on the network is treated equally and on a first-come, first-served basis. There is no host concept. The IBM PC Network Program is a peer network.

POLLING Most commonly used with the star topology. One controller polls each node sequentially and waits for data or a negative response. Networks can prioritize nodes by polling certain nodes more often.

A technique whereby a master device asks subordinate devices if the devices have anything to transmit. A device may not transmit unless asked.

PRINT SERVER A device used in association with software that allows a disk to be shared, but does not provide for sophisticated file handling.

PROTOCOL The type of standards used for communications: CSMA/CD, Token ring, etc.

RECORD LOCKING The ability of a software application, with the network software, to deny access of a record within a database file to other users, for example, when one user has opened that record for updating.

REPEATER A device used to extend the range of a LAN.

RESOURCE SHARING Giving more than one user on a network access to a single resource like a hard disk or printer. It makes use of each resource more efficiently. As an analogy, it more efficient for eight people to take one station wagon from point A to point B than eight separate motorcycles.

RF MODEM Radio Frequency Modem - The part of the IBM network card from which the signal is transmitted onto the medium. The equivalent on EtherNet is the transceiver (XCVR).

RING In a ring topology the nodes are connected by point-to-point links and arranged in an unbroken circular configuration. The IBM Token Ring is a modified ring.

SEMAPHORE A flag that tells a multi-user application which records are opened for update. The application software uses the semaphores to provide records and file locking. DOS 3.1 provides the flags for multiuser use in many network software today.

SERVER A node on the network that provides a specific service to users. Typical server functions include: file servers, print servers, gateway servers, and routing servers.

The device used to control the operation of the network - Either a computer that can also be used as a workstation or a dedicated device.

SNA System Network Architecture: An established IBM technique for interfacing non-IBM mainframe devices to IBM mainframes. A common way of interfacing LANs to IBM mainframes.

STAR In a star topology all nodes are joined at a single point. Control of the network is most often located at the central node. If not, the central node generally serves as a simple switch to establish circuits between outlying nodes.

TAP A small box that clamps around a cable and makes electrical contact with the network cable and allows a device to be connected the network.

TERMINATOR A passive device put on each end of a cable segment to keep the signals from reflecting and consequently interfering with other traffic on the cable.

TIME DIVISION MULTIPLEXING A single frequency band is used in turn by several devices.

TOKEN An address and data area that is passed around the ring in a ring topology. A free token is recognized by the sending node. The node adds data and addresses and sets the token busy. The receiving node removes its data and frees the token. An analogy would be a streetcar that goes from stop to stop along its route looking for a passenger. Only one passenger may board the streetcar at one time and that passenger controls the streetcar until the destination is reached.

TOKEN RING A technique whereby a signal is passed down the cable. The signal is intercepted by a device that needs to transmit data. No data can be transmitted unless the device has possession of the token. When the device finishes transmitting, the token is passed along.

TOPOLOGY The logical and physical configuration of the stations in a local area network (ie., bus, ring, star, tree). Physical connections are actual electromechanical circuits between nodes. A Logical connection implies that two nodes are able to communicate, whether or not they have a direct physical connection.

TRANSLATOR On the IBM/PC Network, the root of the network where all messages are converted from a transmit frequency into a receive frequency.

TREE A tree topology is characterized by having the parts of the network branch from some centralized location: in the case of the IBM Network, the translator.

TRUNK Generally refers to the main cable run of the medium along which network nodes are attached.

TWISTED PAIR Two shielded wires used to transmit data. The twisting prevents the signals on the wires from interfering with each other.

VOLUME A logical section of a hard disk drive. Either a fixed size or a directory or subdirectory under DOS. In EtherSeries it is a fixed size. For instance, a 10mb drive may be logically divided into 4 equal sections. Each section would result in a 2.5mb volume. Security is sometimes placed on the volume as read, write, create, etc. or some combination.

WIDE-AREA NETWORK A network that provides data communication capability in geographic areas larger than those served by local networks. Usually a common carrier is used. Examples of public Wide-Area Networks include Telenet, Tymshare, MCI, etc.

WORK STATION Usually a keyboard/CRT device - like a PC - attached to a networking system.